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THE NEW PROGRESSIVE GEOGRAPHIES
DEVELOPED ACCORDING TO THE PROBLEM METHOD

CALIFORNIA

BY

HAROLD W. FAIRBANKS, PH.D.

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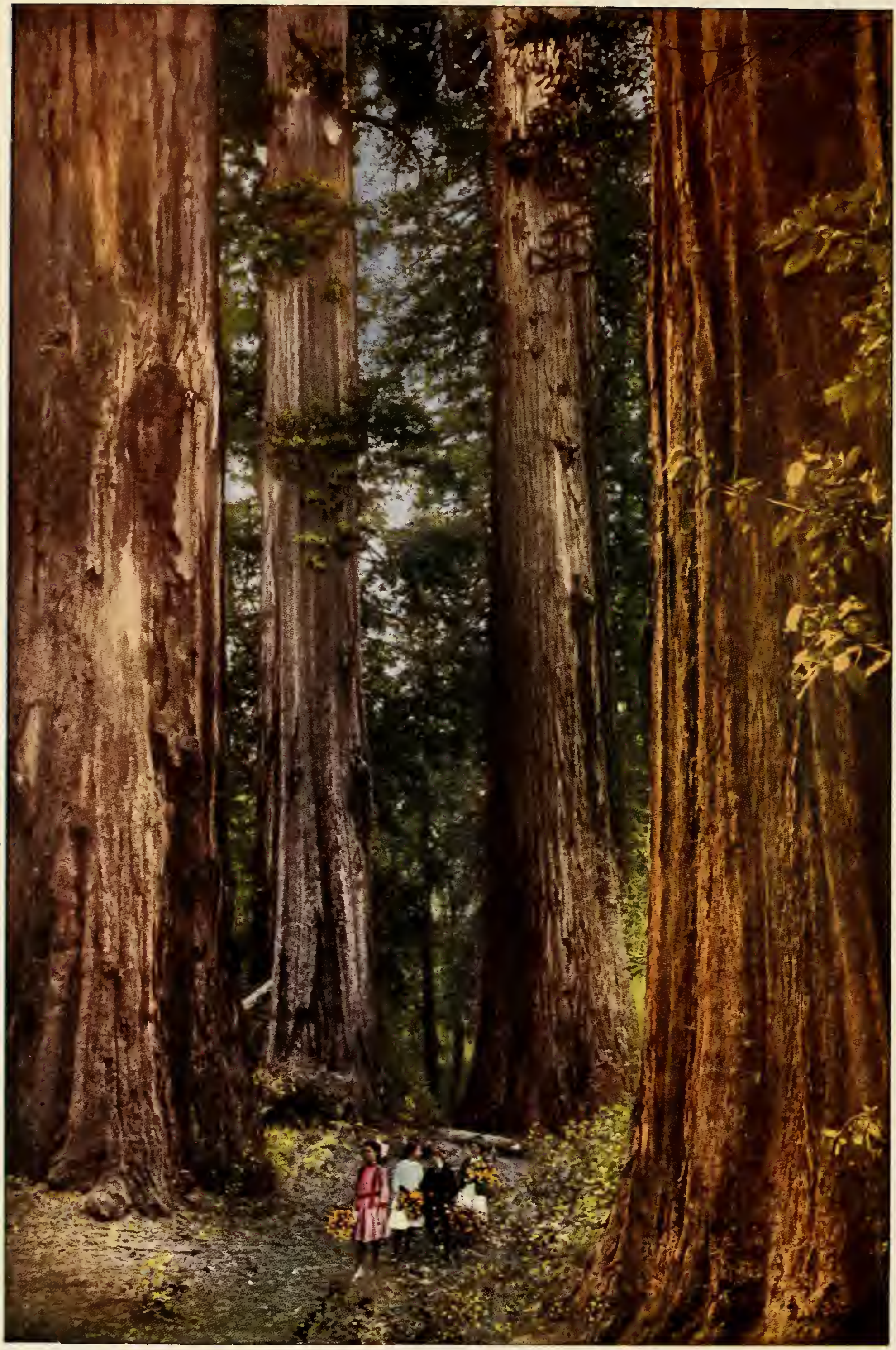


Among the Giant Redwoods of the Coast Ranges

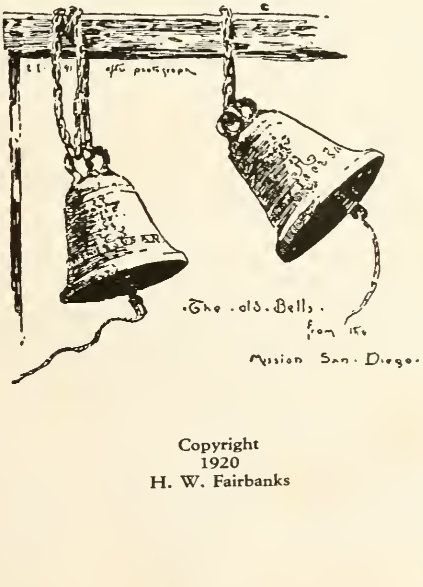
THE NEW PROGRESSIVE GEOGRAPHIES
DEVELOPED ACCORDING TO THE PROBLEM METHOD

CALIFORNIA

BY

HAROLD W. FAIRBANKS, PH. D.

Author of
Home and Its Relation to the World
Topical Outlines of the Geography of the Continents
Developed According to the Problem Method


after photograph
The old Bells from the Mission San Diego

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PREFACE

The new series of Elementary School Geographies of which this volume forms a part has been worked out along lines entirely different from any other American text.

The two-time-over plan has been abandoned for a **progressive** course in which each country is studied but once. The descriptive method in which the memory plays the chief role has been replaced by one in which reason and thought, based on experience, are the moving forces.

The aim of this, the second book in the New Series, is twofold: first, is to give the child such a conception of his own state as will be of some real use to him in daily life; and second, to afford a foundation for an intelligent study of the world at large. When the child understands how people about him are influenced by their environment he has acquired the ability, with the aid of a good physical map, to form conclusions as to how people in distant lands are affected by their environments. This view leads us to look upon facts not as the aim but rather the tools by the aid of which true geographic understanding is reached.

To accomplish this aim, a readjustment of emphasis is necessary. Instead of giving a few weeks here and there in the course to the home, state or natural region in which the child lives, and thus making the home region incidental to world geography, the method employed in the present series assumes that an understanding of the home is the indispensable prerequisite to a real knowledge of the world.

Working the above out by means of the **problem method**, the study appears to the child to take on a definite purpose. It becomes intensely interesting and leaves a permanent impression.

From the point of view outlined, no apology need be offered for putting within reach of the children of California this book, which is intended as a basis for a year's study. Such a study naturally falls in the fifth year and before formal world geography is commenced.

H. W. FAIRBANKS.

Berkeley, Cal., April, 1920.

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ARGUMENT

FOR

THE NEW PROGRESSIVE GEOGRAPHIES DEVELOPED ACCORDING TO THE PROBLEM METHOD

BY

Dr. H. W. Fairbanks

The following plan of a new series of school geographies has been worked out as a result of the conviction on the part of the author that the subject of school geography needs remodeling along new and wholly different lines and that none of the present text-books meet the demand of this more modern and rational view of the subject.

The proposed geographies differ from those now in use in three important particulars, namely:—in method, in distribution of emphasis, and in the handling of the map question.

1. **Method.**—The current texts are based in great part on the idea that geography is a study of facts about the earth. These books are filled with an almost innumerable number of facts which according to the method usually followed are acquired through memorizing with little inquiry into the matter as to whether these facts are really understood.

In the New Series an attempt is made to practically do away with the memorizing of facts as facts. The vast amount of detail found in all the current texts is dispensed with. The thinking powers of the pupils are aroused through the development of the causal relationship which exists among facts, and which relationship alone leads to true geographic knowledge.

One of the primary objects in the method of presentation employed in the new texts is to develop the interest of the pupils through the use of "problems." By this means the otherwise dead facts are clothed with life.

The method of presenting all facts in the light of their natural associations and from the point of view of their influence upon life might be called the "biological method." It not only makes the subject matter of the geography seem worth while to the pupils, a very important thing in itself, but it brings out clearly the scope and bounds of geography, a notion which is lacking in the current texts as well as actual school-room practice.

In the biological method of approach all materials are presented from the standpoint of their relation to the earth as a **living organism.** A mountain, for example, is not studied merely as a physical feature of the earth but from the point of view of its relation to the people who live at its base. Every fact that has any vital relation to elementary school geography is thus made significant.

The two-time-over plan in current use is discarded as it is believed to be wasteful of time and effort and not to lead to the best results. A **progressive** course is substituted for the present one and in this course the world is gone over in a formal manner but once. The objection sometimes raised to this plan that some children may leave school before the continents have all been studied is met by the statement that in the latter half of the fourth year there is a general survey of the world, and that it is of far greater importance that such children should have a working knowledge of their home, state and native land than that this should have been neglected and their time spent in memorizing meaningless facts about distant lands.

2. **Distribution of emphasis**:—To make geographical relations in distant lands really intelligible the new plan not only emphasizes home geography, but goes much farther and assumes that an understanding of the home is the indispensable pre-requisite to a real knowledge of the world. It is only

when the pupils have gained a working knowledge of the relation between the people about them and their environment that they are able to understand the environments of peoples in distant lands.

The extended study of the home called for by the plan of the New Series results in remarkably rapid and intelligent progress when the pupils reach the study of distant lands. The knowledge gained of life relations in the home is carried directly over to the new land, no matter in what part of the world it is situated. When a good map is furnished the pupils they are able to reason out conclusions as to life conditions wherever life is studied.

3. **The problem of map study:**—The New Series of Geographies is to be illustrated with half tones and colored plates but maps are to be excluded from the text-books and bound in a separate volume or **Atlas.** This has long been the established custom in the leading foreign countries, and is likely soon to be the rule in the United States. One of the most serious defects of the current geographical texts is not only the small size of the maps but their usually poor character.

The advantages of an atlas might be stated as follows:—

1. The maps can be printed on a scale large enough to make them clear and comprehensible.
2. The atlas can more easily be preserved as a handy book of reference when not encumbered with the text.
3. The text can be bound in a more conveniently sized volume than when an attempt is made to adapt it to the needs of maps.
4. An atlas bound in one or two parts could be made to last for the whole school course.

The New Geographies can be divided conveniently into four volumes as follows:

Vol. I. **Fourth Grade:**—An elementary text in Home Geography which includes in the latter half a discussion of the peoples of other parts of the world through the interchange of products between them and the people of the California home. This introductory work is made as real as possible through the use of pictures and the globe or map of the hemispheres.

Vol. II. **Fifth Grade:**—California and other parts of our country as they are related to California. A good wall map or relief model a necessity. (A small atlas of California is to be prepared to accompany this Volume.)

Vol. III. **Sixth Grade:**—North America with emphasis laid upon the United States. Physical wall maps a necessity.

Vol. IV. **Seventh and Eighth Grades:**—The remaining portions of the world taken up in that order which brings the most important regions early in the course. North America is naturally followed by South America, Europe, Asia, Africa and Australia.

The Geography of Current Events should be introduced periodically throughout the course.

It is not at all essential that Europe be taught in the Sixth Grade to meet the needs of Sixth Grade history. All the geography which is needed for the history can better be given as a part of the history.

The author has employed the historical development of the different lands as a motive through the series but this does not imply that geography should be made subservient to history as is often done.

CHAPTER I.

Topic I.—A Land of Gold.

A Land of Fabulous Riches to Reach Which the "Gold Seekers" or "Argonauts" Suffered Untold Dangers and Hardships.

How were the Pioneers of California like the Argonauts of the Old Legend?

According to the ancient Greek story, Jason and his comrades set sail on an expedition to a distant region in search of the Golden Fleece. These adventurers are known as Argonauts. So it came about that the Pioneers who started out from the Eastern States to find the hidden gold in far away California were called "Argonauts."

Was there much known about California at the time of the discovery of gold in 1848?

Although explorers had described California as an attractive land blest with perpetual spring, it had at the time of the discovery of gold few inhabitants besides Indians and easy-going Spaniards.

Southern California and the valleys of the Coast Ranges had been occupied for many years by the Missions and scattered Spanish ranches. Daring American explorers had crossed the mountains and deserts to the Great Valley. Captain Sutter had built a fort near the junction of the American river with the Sacramento and had commenced to raise stock and cultivate the land.

General Fremont, known as the "Path Finder," had explored much of the interior and had nearly lost his life in crossing the Sierra Nevada Mountains in midwinter.

How did the discovery of gold affect the story of California?

1. **The land filled quickly with thousands of people:** The Mexican War had just ended and California had become a part of our country when Marshall made his great discovery of gold in a mill race in El Dorado county.

The news spread quickly and in a few months thousands of people were on their way to the land where the stream gravels were reported to be full of gold which was to be had merely for the digging.

In less than a year San Francisco Bay had filled with ships from all parts of the world and an almost continuous line of ox-wagons filled with gold seekers marked the newly opened road across the continent.

Soon prospectors spread through the foothills of the Sierra Nevada and Klamath Mountains. Their camps were scattered all along the streams, while little towns sprang up where the "bars" were richest in gold. Thus life and bustle suddenly replaced the quiet which had ruled in California for so long.

2. **If it had not been for the golden magnet, California would have settled slowly, as did Oregon and Washington:** Before the discovery of gold, Marcus Whitman had led the way to the rich farming lands of Eastern Oregon, but because this region was so far removed from the Eastern settlements, and the dangers of the journey to the Far West were so great, the country settled slowly.

It was very different in the case of California. The tales of gold aroused a great excitement over the whole country The journey to this region, although more difficult than the one to Oregon, did not, nevertheless, prevent thousands from attempting it, and so the population increased rapidly.

3. **The growth of other industries:** For a time mining was the only thing thought of. Ships were deserted by their crews; clerks left their stores and farmers abandoned their fields. But there were many who did not "strike it rich" and soon returned to their previous occupations.

Stock raising had been the leading industry of this region from the earliest days of the Spanish settlement, but hides, wool and tallow were the only products for which there was any sale. With the coming of thousands of emigrants there arose a great demand for meat. The growing of grain, fruit and vegetables also became important, for all farm products brought fabulous prices.

The great distance of California from any point where manufactured products could be obtained soon led to the establishment of many industries to supply the needs of the growing population.

Topic II.—California, a Land of Fruitful Gardens.

A Pleasant Land of Mountains and Valleys in Which is Found Every Sort of Climate and Where Grows Almost Everything That One Could Wish.

How California received its name.

A Spanish story written long ago tells of a fabulous island in the "South Seas." This island was called California. It was said in the story to be inhabited by Griffins and to abound with gold.

Spanish sailors sailing westward from Mexico came to what they thought was an island lying far out in the Pacific Ocean. To this land they gave the name of California, although no Griffins were found in it, and many years passed before its golden treasures came to light.

The land thus discovered is now called Lower California, but Upper California, the land in which we live, was not visited until many years later.

Lower California is really a peninsula, as you can see from the map, instead of an island, and extends south from our California. Upon the old Spanish maps the whole of California is pictured as an island with a long, narrow strait separating it from the mainland. We now know that this land is not an island. The southern end of the supposed strait is the Gulf of California, and the upper end is Puget Sound.

Where lies California?

Our California home is far away to the westward of where the Pilgrims landed and upon the opposite side of North America. It faces west toward the broad Pacific Ocean, along which it stretches for nearly one thousand miles. The boundaries of California were once very indefinite, but much greater than they are now. It included all that land reaching from Mexico on the south to Oregon on the north and from the Pacific Ocean east to the Rocky Mountains.

The states of Utah, Nevada and a part of Arizona have been made out of this vast territory and what remains forms the California of today which we are going to study.

—Auto Club of Southern California.

Giant breakers in Santa Monica Bay.

What sort of land is California?

If we sail along the coast of California, as did the early navigators, we find that it has a very even shore line and apparently few bays that offer protection from storm. Viewed from the sea this land appears to be mostly mountains through which occasional valleys open, and we are thus at first led to believe that its surface is too rough to support many people.

We discover finally that there are more bays than we at first supposed and that in and behind the coast mountains there are many great valleys. Entering San Francisco Bay we are led through the mountains that guard the coast and far into the interior.

Rich and beautiful valleys lie among the mountains, but it is not until we have passed the strait of Carquinez that the largest one comes in sight.

An almost boundless plain, known as the Great Valley, now stretches out before us. Far to the east we get a view of the snow-covered Sierra Nevada Mountains. To the north we may be able to see Mt. Shasta, one of the highest volcanic peaks in the United States. To the south are other mountains, but too far away to be seen. Thus this great valley is inclosed upon all sides except for the opening through which we enter. It is so rich and of so vast an extent that even if there were no others California would nevertheless be a wonderful land capable of supporting many millions of people.

But this is far from being all of the land that we are studying. Away to the south, beyond mountains and desert, lies the Los Angeles-San Bernardino Valley. This is another vast lowland which, unlike the Great Valley, is open to the sea and is broken by hills and mountains.

This valley is shut in on the north and east by lofty mountains. From the summit of San Gorgonio, the highest of their snow-clad peaks, we see that these mountains separate the fertile valleys of Southern California from trackless deserts which extend farther than our eyes can reach.

The strange thing which we note about these deserts is that their slopes do not lead to the sea but form basins instead. None of the rain which falls in these basins ever reaches the sea.

Why is California such a pleasant and fruitful land?

California is, then, a land of mountains, valleys and desert plains. Each of these slopes has its own climate and each has its own productions which are different from the others.

So agreeable is the climate in most parts; so varied are the natural resources, and so attractive is the scenery, that we speak of this land as a pleasant and fruitful garden.

How has Nature made a garden of California?

1. **California has a fertile soil:** The soil is formed from the rocks, and since there are in California many kinds of rocks, there are also many kinds of soil, each suited to growing certain plants best.

The rocks are slowly crumbling, and everywhere, except upon the steepest slopes, a mantle of soil has accumulated over them, forming the smooth surface of the land. The soil is richest and deepest in the valleys, where the rains have washed the finer particles from the steepest slopes.

2. **California has a favorable climate:** A favorable climate is the first thing that Nature requires for a garden. The soil may be rich but, unless there is the right amount of water and a warm sun, plants will not thrive.

We have taken the natural gardens of this region, cultivated the soil, added water where it was needed, set out in them plants from many other parts of the world, and now, because of the many sorts of climate which they possess, we raise almost everything which one could wish.

We can say then truly, that, with the exception of the very hot and moist tropics, we grow in California food products native to all the climates and countries of the world.

The valleys along the coast are cool and moist and the temperature varies but little between winter and summer.

The climate of the mountains is warm in summer and cold and snowy in winter.

Behind the mountains, where the sea winds do not reach, the summer is very hot and the rainfall is small, while still farther in the interior are dry and burning deserts.

3. **California has a rich plant and animal life:** When first discovered by white people California was found to support a wonderful variety of plant and animal life. The forests were not surpassed by any others in the whole world. The mountains and valleys were alive with animals and land birds, while the marshes, lakes and shores were covered with water birds.

Is all of California a luxuriant garden?

A favorable climate and fertile soil are needed to make a garden. Nature has not given these equally to all parts of California. As we journey through the valleys and over the mountains we see that the animals are more abundant and the vegetation richer in some places than in others.

It rains more toward the north, so that in that direction the forests are heavier. The valleys near the coast receive more rain than those of the interior. The mountains receive more rain than the valleys.

If we climb to the summit of the Sierra Nevada Mountains we find that it steadily becomes colder. We reach a region at last where it is so cold that the trees grow only to the size of bushes or disappear entirely. Here there are few animals and no vegetation but Arctic flowers and mosses.

From the summits of the Sierra Nevada and Sierra Madre Mountains we can look down upon vast desert plains shut off from the cool, moist winds of the coast. The animals and plants that inhabit this region are curious and unfamiliar, for they have become changed by living where there is little rain.

We learn, then, that Nature has bestowed her gifts very unevenly over California. Certain parts are barren because of too little rain, while other parts are barren because of too great cold. The larger part, however, has a climate suited to the making of a vast and fruitful garden.

What led to the settlement and cultivation of this garden?

1. **Our California Garden remained for many years much as Nature made it:** The Indians inhabited California for hundreds of years, but they had no use for the forests, nor did they cultivate

the soil. Wild game, fish, roots and nuts furnished enough for their simple needs.

When the Spanish came they, too, found little need for work. From the fertile soil and from the increase of their herds they obtained, with little exertion, all that they required.

2. **The discovery of gold and the coming of an energetic and industrious people:** When gold was discovered everything was suddenly changed. Thousands of brave, active and energetic men poured into California from the Eastern States. They overcame untold dangers on the long journey and suffered many hardships in the new land. Thus it came about that, after many years of quiet, the great state of California was born almost in a day and is now one of the most important in our country.

3. **The growth of a market for produce and the opening of a way to reach this market:** The greater part of the people of the United States live east of the Rocky Mountains, far from California. The mild climate of the valleys of our state permit the growing here of many things which cannot be grown in the East and which the people there are glad to get. But until we had secured a cheap and easy means of sending our produce to this market, there was no use in raising more than we needed at home.

Placer miners panning the gravel for gold.

Hides and tallow had been shipped away by water since the earliest days. After the discovery of gold the growing of wheat, oats and barley became, next to the raising of cattle and sheep, the most important farm industry, for they, too, could be shipped by water. The building of the railroads finally opened the Eastern market and led to the rapid settlement of the fertile valleys. Many thousands of carloads of fruit and vegetables are now sent East across the continent every year, while the opening of the Panama Canal affords still other markets.

Topic III.—California as the Home of the Indian.

Where did the Indians come from, and have they been here long?

When white people first visited California they found it settled thickly with Indians. There were many different tribes, each speaking a different language, but their features, their habits and customs were much alike.

It is believed from the resemblance of the features and customs of the Indians to those of the natives of Northeastern Asia (Siberia) that their ancestors came from that region. They could reach Alaska across Behring Strait, and then it was easy to migrate southward.

There are several reasons for believing that the Indians have been here thousands of years. One is that they speak so many different languages. It must have taken many thousands of years for languages so distinct to grow out of the common language which their ancestors probably spoke.

Another reason is furnished by the shell mounds. The Indians used to gather along the shores of the ocean and bays for feasts of shell-fish. The refuse from these feasts slowly accumulated and finally formed mounds; the largest of these are at Shell Mound Park and at Richmond on the shore of San Francisco Bay. These mounds were begun so long ago that since that time there have been changes in the level of the sea and land. The bases of these mounds are now sunken below the level of the bay.

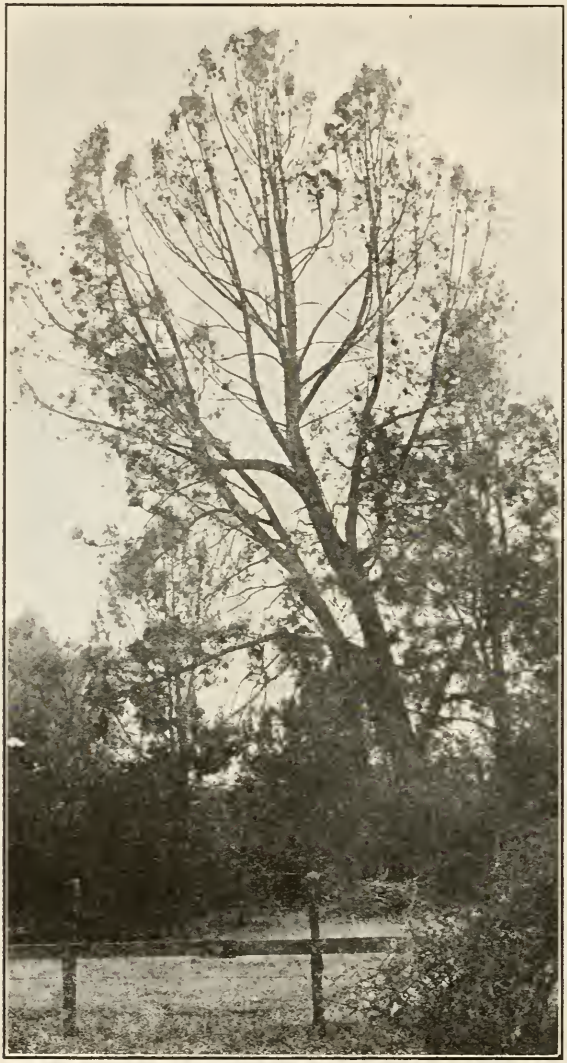
Something about the life of the Indians.

The climate of much of California is so mild that the Indians wore little clothing. Their huts were very simple and easily made. A common form was a circular one, made by placing poles in the ground and bending them over and tying them at the top. These poles were covered with skins, bark, reeds or branches, and then sometimes plastered with mud on the outside.

They did not cultivate the soil, but had no difficulty in getting what they wanted to eat. The water was full of fish and the land abounded with game. Besides these, there were berries, nuts, acorns and many kinds of roots. Because of their custom of digging roots, these Indians have often been called "Diggers."

They made no pottery or cloth, but wove beautiful baskets which we now prize very highly. They crushed their food in stone mortars, which were sometimes mere hollows worn in a large flat rock.

Why have the Indians so nearly disappeared?



A Digger pine, so named because the nuts are used by the Digger Indians.

Found in the Coast Ranges and foothills of the Sierras.

Once the villages of the Indians could be seen thickly scattered along the streams and about the springs. We can still tell where they were by the dark rich soil filled with fragments of bone, shells and flint arrow points.

Now we seldom see an Indian except in the wilder and less settled parts of the state. The Padres tried to civilize them and make them live in houses, but they became sickly and rapidly died off. The most of those that still remain live upon lands called **Reservations,** which are held by the Government for their use. They get a part of their living from cultivating the land and a part from hiring out to white farmers.

Our treatment of the Indians has not always been just or wise. We should protect them and allow them to live the sort of life for which Nature has fitted them.

Topic IV.—California as the Home of the Spaniard.

How was it that California was settled first by the Spaniards?

1. **Because of nearness to Mexico with a direct route by sea:** When Balboa discovered the Pacific Ocean he claimed for Spain all the lands bordering upon it.

After the conquest of Mexico the Spaniards embarked upon the new ocean for the purpose of taking possession of its lands and converting the natives to the Catholic religion.

They first landed upon Lower or Baja California, which they took to be an island. Then they sailed northward and reached the land about which we are studying and called it Upper or Alta California.

2. **Because the American colonies were far away and separated by hostile Indians, mountains and deserts:** The first American settlers had all they could do to establish their homes upon the Atlantic Coast without attempting to explore and settle the vast land which extended away into the interior of the continent.

Besides this there were many more barriers in the way of such explorations than lay in the paths of the Spaniards. In the first place, forests inhabited by savage Indians stretched westward over the Appalachian Mountains to the Mississippi Valley. Beyond this valley were broad plains reaching to the Rocky Mountains; then

A Klamath River Indian.

hundreds of miles of deserts, and, last of all, the Sierra Nevada Mountains.

Our New England forefathers knew nothing of all this region, nor had they heard of California and its attractions. Even as late as the Mexican War and the conquest of California, many of the people in the East thought the Far West was a worthless, barren region which it would never pay to bother about.

Why was it that most of the Spaniards settled near the Coast of California?

It was easier to reach California by sea than by land, for many hundreds of miles of sandy desert lay between this region and Mexico. For this reason the land journey was not only dangerous but required a long time.

It was but natural, then, that the first settlements should be made at those places upon the coast, such as San Diego and Monterey, where there was protection for ships.

The valleys near the sea offered attractive places for settlements. Here there was water for irrigation and large areas of rich land. Inland the climate was found to be drier and besides there was more danger of attack by Indians.

What influenced the Padres in their selection of Mission sites and towns?

The Padres soon learned that the new land had long, dry summers, like those to which they had been accustomed in Mexico and Spain. To grow successful gardens in such a climate it would be necessary to irrigate them, and hence their settlements were made where there was plenty of water. The Padres also had in mind the quality of the soil.

Hence every Mission was placed in a rich and well-watered valley. The places selected were also determined, in part, by their nearness to the villages of large numbers of Indians, so that they could be more easily induced to attend religious services.

Why did the Spanish settlers cultivate so little of these rich lands?

Each mission or rancho had its own carefully-kept garden and grain-fields to supply the home needs, but it was useless to raise more, for there was no market.

As a result most of the land remained unplowed and covered with its natural carpet of wild grasses. On these pasture lands countless thousands of cattle and sheep fed. However, even they were of little value, for hides, tallow and wool were the only products for which there was a market. Trading vessels, which occasionally visited the coast, took these things in exchange for various manufactured articles.

Santa Barbara. A Typical Mission Scene

How the geography of Northern California hindered that region from becoming a Russian province.

The Russians discovered and claimed Alaska and built trading posts along its shores. They had great need of fresh meat and vegetables in this far northern region, and, searching for a place in which they could supply themselves with these things, sailed down the coast to California.

Finding the land unoccupied they landed a few miles north of the mouth of Russian River and built a stockade to which they gave the name of Fort Ross. They explored the adjoining country, went on hunting expeditions to the Farallone Islands, and even entered San Francisco Bay. They would have liked to have taken possession of this fair region, but feared to disturb the Spanish, who had already established the Presidio of San Francisco and laid claim to all the surrounding region.

The Russians never extended their territory inland from Fort Ross, for the unbroken Coast Ranges, steep and difficult to cross, shut away from them the warm and fertile valleys of the interior.

As a direct result of the obstacles which Nature had placed in the way of the Russians enlarging their holdings, they finally abandoned the fort and sailed away.

How did California appear when in 1848 it became a part of our country?

If we could have visited California at this time we should have looked upon a vast region of forested mountains, oak-dotted valleys and almost boundless plains. The whole country still remained almost as Nature made it.

A few white settlers occupied the valleys near the coast. A string of missions stretched from San Diego to Sonoma and close to them had grown up a few small towns. The chief of these were San Diego, Los Angeles, Ventura, Santa Barbara, San Luis Obispo, Monterey, Santa Cruz and San Jose.

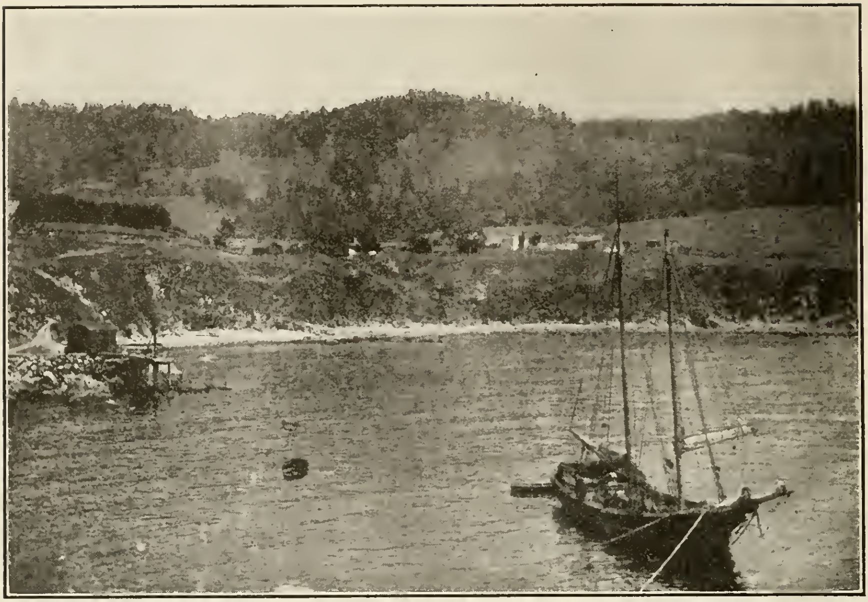
As the Spanish settlers came they were given grants of land by the Mexican government. Nearly all the best lands of the coast region were thus divided into ranchos which were often many miles in extent.

Here and there were the white-washed adobe ranch houses with their many outbuildings and corrals. There were no fences, but each man's cattle were known by the "brand."

Twice a year each man held what was called a Rodeo or "Round Up," which simply meant the gathering of all his cattle. The spring round-up was for the purpose of branding the calves, while that of the fall was for separating the stock intended for market.

The Rodeo, as well as the sheep-shearing time, were the occasions of merriment and festivity.

Antelope, elk and deer abounded. The thickets were filled with



Fort Ross—Coast Ranges in background. Boat loading by cable in foreground.

bear and other predatory animals. The forests were almost untouched and most of the land was unplowed. In the spring the valleys and plains were covered with the brilliant poppy and other wild flowers.

The end of the quiet California days.

The discovery of gold a few months after the conquest of California made a wonderful change. Gold seekers began to pour into California from every direction. They came in through the Golden Gate and passed up the Sacramento River. They crossed the mountains and deserts in their ox-wagons by way of Oregon, by way of Arizona, but, in greatest numbers, by the main overland trail through Nevada and across the Sierra Nevada Mountains.

They came by the thousands and scattered through the foothills of the gold belt and then spread into the fertile valleys. Life and bustle succeeded the quiet which had reigned here so long.

SUMMARY.

The discovery of gold in California led to the rapid settlement of a region remote and difficult to reach.

When mining became less profitable the pioneers turned to the cultivation of the fertile valleys, and soon this state, which first became widely known as a land of gold, became even more celebrated for its golden fruits and agreeable climate.

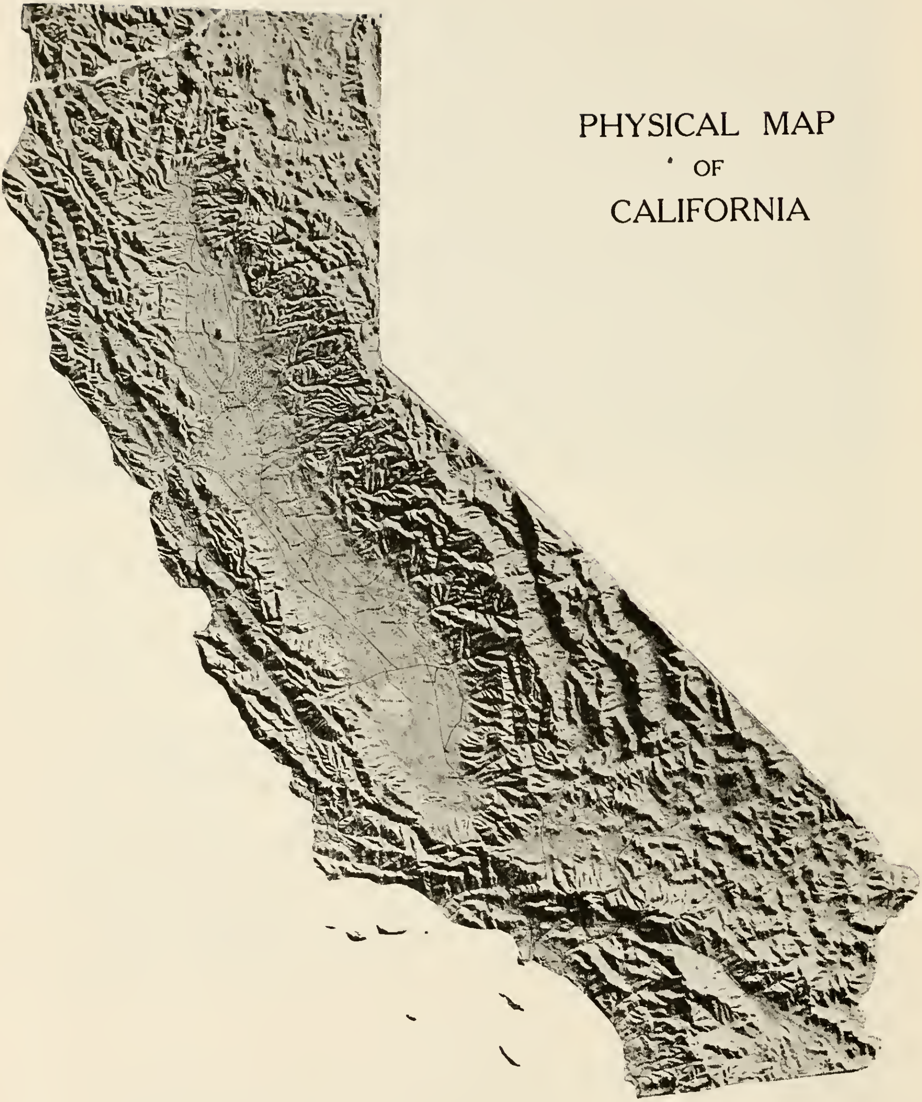
Neither the Indians nor the Spanish made use of the natural resources of California. In a short time after the coming of the Americans these were developed more than they had been during all the past history of the region.

REVIEW QUESTIONS.

Why is gold so earnestly sought after?
Why was it so difficult to reach California in the early days?
Describe any Indians which you have seen.
Tell what you can about their weapons and utensils.
Why did the Indians disappear so quickly from the most of California?
Did any American Indians cultivate the soil before the whites came?
Why did the Spanish settlers give the most of their attention to stock raising?
Why did they not settle the interior valleys?
By what routes and by what means is produce now shipped out of California?
Mention some of the most important things which we export.
What other country besides Russia would have liked to obtain California?
Tell from your own observations something about the differences in the climate of the coast, the mountains, and the interior.
Tell what is needed in order to raise a good garden.
How are lands, in those parts of California where the rainfall is not sufficient, made to produce abundantly?

PRACTICAL LESSONS.

A country of mountains and valleys has a more varied climate than a level country.
Men will undergo the greatest hardships and dangers and go to the most distant regions in the hope of getting gold.
If the geography of California had been different it might never have become a part of the United States.
A garden may be ever so rich, but it will produce little but useless weeds if not cultivated.
California was so far away and so difficult to reach that if it had not been for gold it would have settled up slowly.
Civilized people make much more use of the natural resources of a country than do savages.



PHYSICAL MAP
OF
CALIFORNIA

CHAPTER II.

TOPIC I.—The Main Routes by Which the Pioneers Reached California.

Did the Pioneers have maps to guide them in their journey across the continent to the new land?

Before the discovery of gold little was known of all that vast region between the Mississippi River and the Pacific Coast. The first men to penetrate the recesses of the Rocky Mountains were the trappers and traders in search of furs. Then came the noted expedition of Lewis and Clark which was the first to cross the Rocky Mountains and reach the Pacific. The route followed was, however, far to the north of that used by the gold seekers, lying as it did much of the distance along the Missouri, Snake and Columbia Rivers.

General Fremont did more than any one else to make known the routes to California, and for that reason has been called the "Pathfinder." He and his party nearly perished in mid-winter on the summit of the Sierra Nevada Mountains while trying to find a river which they supposed rose in the Rocky Mountains and flowed westward into San Francisco Bay. They found, instead of a river, a lofty snow-covered range of mountains called by the Spanish Sierra Nevada, meaning snowy range.

If such a river had really existed it would have been easy for the pioneers after crossing the Rocky Mountains to follow it down to California. Many perished while seeking out new trails, for they did not know of the dangers ahead of them. The first maps of this region, as in the case of that used by General Fremont, were worse than no maps, for they were so incorrect.

The water routes to California.

There were two ways of reaching California by water. The shorter way was down the Atlantic Coast to the Isthmus of Panama, and then up the Pacific to San Francisco. Thousands came this way, but many died of fevers while crossing the Isthmus.

The longer water route was around Cape Horn, the southern point of South America. This journey took six months and was also dangerous because of the frequent and severe storms around the cape.

A large part of the supplies for California came around Cape Horn in the early days, and continued to do so down to the time of the opening of the Panama Canal.

The land routes to California.

We must remember in the first place that the vast region which lay between the Mississippi River and the Pacific Ocean was almost unknown at the time of the gold excitement. It was made up of broad plains, mountain ranges and deserts. The mountains were difficult to cross, while the deserts were almost without water and forage. The roads or "trails" must for these reasons follow certain routes where there were streams or springs and cross the mountains at points where they were lowest—that is, through mountain passes. There were a number of different routes which we ought to know something about.

A. **The Great Salt Lake and Carson Trail:** This was the direct route used by most of the emigrants. It started at St. Louis and followed the Platte River much of the way across the plains. Passing through the Rocky Mountains a little north of Great Salt Lake, it crossed the deserts of Utah until, reaching the Humboldt River in what is now Nevada, it descended this river to the "Sink of the Carson." Here was the broad, much dreaded, desert in which the waters of the Carson River sink.

After the crossing of the desert came the Sierra Nevadas. If it was summer their cool forests and refreshing waters were greatly enjoyed. At other seasons its winds were icy and snows blocked the trails. When once these mountains were passed it was easy to reach the gold fields which lay along their western base.

B. **The Santa Fe Trail:** The Santa Fe Trail was the old trading route from St. Louis to New Mexico and Old Mexico. The emigrants followed this trail to Santa Fe and then turned west across Arizona toward Southern California. This route was more dangerous than the northern one because there were more deserts and the Indians were more savage. After reaching Fort Yuma, on the border of California, they had still the dreaded Colorado Desert to cross before reaching San Diego or Los Angeles.

Strange work of the waves at Point Buchon near San Luis Obispo.

C. **The Oregon Trail:** It was difficult to go from Oregon into California in the early days. The steep mountains and deep, narrow cañons which lay in the way could not be traversed until years later, when costly roads had been built.

Peter Lassen opened a rough road across the volcanic plateau of Northeastern California. It passed near the great volcano now called Lassen Peak. Few emigrants came by this route.

D. **The old Mormon Trail:** A trail used by some of the early Mormon settlers of Southern California started at Salt Lake City and led in a southwesterly direction across Southern Nevada. It crossed the broad Mohave Desert and ended in the Valley of San Bernardino. This route was not used much because of the almost continuous desert with little water and feed for cattle.

TOPIC II.—The California Coast Presented Many Difficulties to the Early Explorers.

The difficulties of the early navigators.

We read in the tales of the early navigators who sailed along the California coast that they found the shore rocky and mountainous with few places where they could anchor their ships in safety. They also report many storms and head winds which continually beat them back. None of them got farther north than Cape Mendocino.

Both Drake and Vizcaino sailed past the Golden Gate, and, probably because of fog, did not see the narrow entrance to the magnificent Bay of San Francisco.

How did the mountainous coast hinder exploration by land?

There would have been little difficulty in going from San Diego to San Francisco and northward even to Oregon if the explorers

Morro Rock—nearly 600 feet high. The grandest monument on the coast of California.

could have followed the shore all the way. This was impossible, however, because in many places the mountains come directly down to the sea so that there is not room for a road or even a trail between the rocky cliffs of the ocean and the steep slopes of the mountains.

How would travel along the shore be made easier if the land should rise a little, exposing a strip of the ocean floor?

Many soundings have been made in the ocean along the coast so that we know much about the bottom. The water has been found to be shallow in most places and the bottom almost as even as a floor. If the land now stood as high as it did once the shore would be many miles out under the blue waters of the Pacific.

The smooth floor of the ocean thus exposed would have offered an open highway for travel the whole length of California if people had only been here to make use of it. Unfortunately the land sank long before any one came to these shores. Now mountains and deserts form a serious barrier between Southern and Northern California.

What more can we learn from the soundings along the California Coast?

The soundings tell us also that the bottom of the ocean along our coast is quite like a plain in most places and that the water is shallow for some distance out from the shore. The strip of shallow water is about ten miles wide along the coast of Northern California, but broadens toward the south until it finally becomes nearly two hundred miles across.

Outside of the shallows the bottom of the ocean floor descends very steeply to the deep Pacific, so that if the water could be taken away and we could see the bottom it would appear like a shoulder along the border of the land.

This shoulder, although now below the sea, marks the western edge of the continent. It has the form of a plateau beneath the sea and so we call it the **submerged continental plateau.**

How would the shore be affected if the land should rise one thousand feet?

The change in the shore line would be so great that we would hardly recognize the new land as California. The present bays would all become dry land, while new ones far out under the present water would take their place. Thousands of acres of fertile valley land would be added to the state.

The new shore would lie outside the Farallone Islands which would become a part of the mainland. A long, narrow bay extending up nearly to the present mouth of the Salinas River would take the place of Monterey Bay. The Santa Barbara Islands would become a part of the mainland also and have a great bay behind them. Farther south Santa Catalina and San Clemente would still remain islands and many shoals forming new islands would appear above the water.

What reason have we for believing that most of the islands have been a part of the mainland?

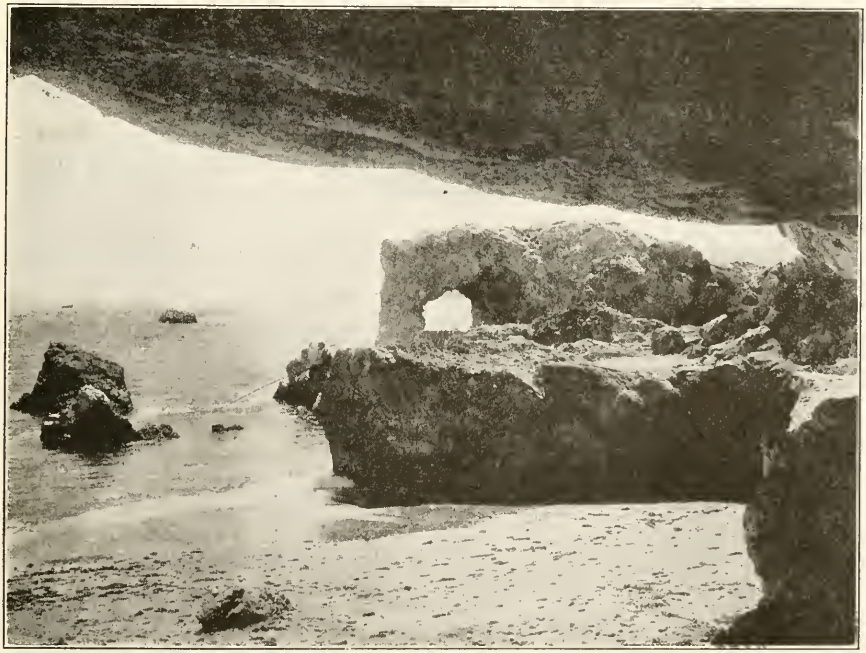
Upon the Santa Barbara Islands have been found the bones of animals that once lived in California but which are now extinct. Among these were the mastodon and horse. These animals could have reached the islands only when they were connected with the mainland.

TOPIC III.—The Slopes of the Land, and the Position of the Mountains and Rivers of California Made it Difficult for the Pioneers to Reach the Mines by All but One Route.

Introduction.

Nature has placed many obstacles in the way of our getting those things which we prize most, and we shall now see how true this was of our California gold.

The most important placer mines were found in the foothills of the Sierra Nevada Mountains on the eastern side of the San



A wave-cut terrace and caves near Port Harford. Made when the ocean stood ten feet higher.

Joaquin-Sacramento Valley, and in the Klamath Mountains at the north end of this valley.

Except for the single outlet through which flows the Sacramento River, this great valley is rimmed all about by mountains, while beyond these are other mountains and deserts.

How did those who came by water reach the mines?

1. **The Colorado River could not be used as a route to the mines:** Why could not the "gold seekers" coming by ship to California have sailed up the Gulf of California and have entered the Colorado River? This great stream, as the map shows us, forms the southeastern boundary of California and appears to offer an easy way far inland toward the north.

In reality, however, the Colorado River is almost impassable for boats except the smallest flat-bottomed ones. The current is rapid and the water shallow and full of ever shifting sand-bars. The lower course of the river is through deserts, while its middle part is in a mighty cañon.

2. **What can we say of the Klamath River as a possible route from the coast to the mines?** Our map shows that the Klamath is a large river rising in Oregon and following westerly across Northern California.

If we could visit this region we should discover that its course is through the Klamath Mountains in a deep cañon and that there is no harbor or landing place at its mouth.

The Klamath River and tributary streams were rich in placer gold, but the stream was no use to the miners in reaching this region. They had to cross the very rugged country which lay between its basin and the Sacramento Valley.

3. **San Francisco Bay and Sacramento River route:** After having searched in vain along the coast of California for any other practical route to the mines, we turn to San Francisco Bay and the great river which empties into it.

We now learn why all the ships with their loads of gold seekers from all parts of the world came to San Francisco. Here was perfect protection from the storms. Here was a great bay opening far into the interior. From the head of this bay a navigable river led almost to the mining camps.

Once at San Francisco all the gold seekers had to do was to embark on river boats. This took them up through San Pablo Bay, the Strait of Carquinez and into Suisun Bay. Here they were in the delta region of the Great Central Valley.

In this delta two streams were found coming together. The one from the northern arm of the Great Valley was called the Sacramento, the one from the southern arm of the valley was called the San Joaquin.

Following up the river which came from the north they came to the town of Sacramento, which had grown up near Sutter's Fort. It was an important point for distributing supplies and was also the end of the overland trail.

Farther up the Sacramento River was Red Bluff at the head of navigation. This town was an important supply point for the northern mines in Shasta and Siskiyou Counties.

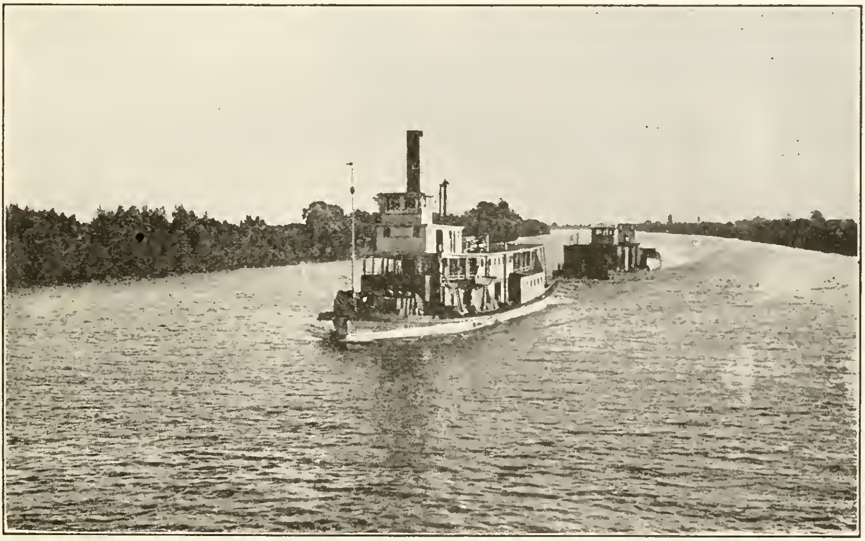
The farthest point reached by boats on the Feather River, a branch of the Sacramento, determined the site of Marysville, another distributing point close to the mines.

The miners who wished to go to the southern mines took a boat for Stockton, a town which had sprung up at the head of navigation on a branch of the San Joaquin River.

What difficulties still lay in the way of those who came overland after they had at last reached the boundaries of California?

1. **The Sierra Nevada Mountains:** The mighty Sierra Nevada Mountains could not be avoided, for they stretched north and south for four hundred miles directly in the path of the Salt Lake trail by which most of the emigrants came. After they had crossed the Great Plains, the Rocky Mountains, and the deserts of Utah and Nevada, the Sierras had to be passed before they could enter the Golden Land.

The Sierra Nevadas are covered with heavy snows during a large part of the year and so the journey had to be planned to reach them in summer or early fall. We must remember also that the emigrants who came first had to make their own roads. They had to get over sharp, rocky ridges and across precipitous cañons where sometimes the wagons had to be taken apart and pulled up or let down with ropes.



Freighting on the Sacramento River.

2. **The deserts and mountains between Southern California and the Great Valley:** The route to the mines by the Santa Fe trail was much longer and offered difficulties even after San Diego or Los Angeles had been reached.

Nature has placed many obstacles in the way of travel between Southern and Northern California. To understand what these are let us take a train from Los Angeles to Bakersfield. We shall have to cross three mountain ranges, two of them by "passes" and one by tunnel. Altogether there are fifty miles of mountains and then the Mohave Desert covering fifty miles more. If we travel over the old stage road we find the country equally difficult to cross.

The Mohave Desert forms a wedge pointing westward and with its inclosing mountains divides California into two parts, and for a long time formed a serious barrier to travel and trade.

The only way by which the early traveler could escape this barrier was by taking the old trail used by the Padres and known as the **Camino Real.**

This trail lies through the valleys near the coast, but it also had to cross several mountain ranges.

To avoid the mountains between Ventura and Santa Barbara the trail descended at one point to the base of lofty ocean cliffs beneath which the traveler could pass only at low tide.

3. **The mountains shutting off Oregon:** The northern end of the Sacramento Valley is inclosed by mountains which are many miles across and were almost impassable in the early days. This difficulty of making a wagon road from Redding to Shasta Valley was very great. When this road was finally opened there remained still the Siskiyou Mountains to be crossed before Oregon could be reached. Those who tried to escape these mountains by entering California over the Lassen trail found that they had many miles of rough lava fields to cross.

Topic IV.—Climate Has Had Much to Do With the Settlement and Development of Our California Garden.

Introduction.

The discovery of gold led to the rapid settlement of California, but it is its **climate** which has had more to do with its permanent growth and present importance than anything else.

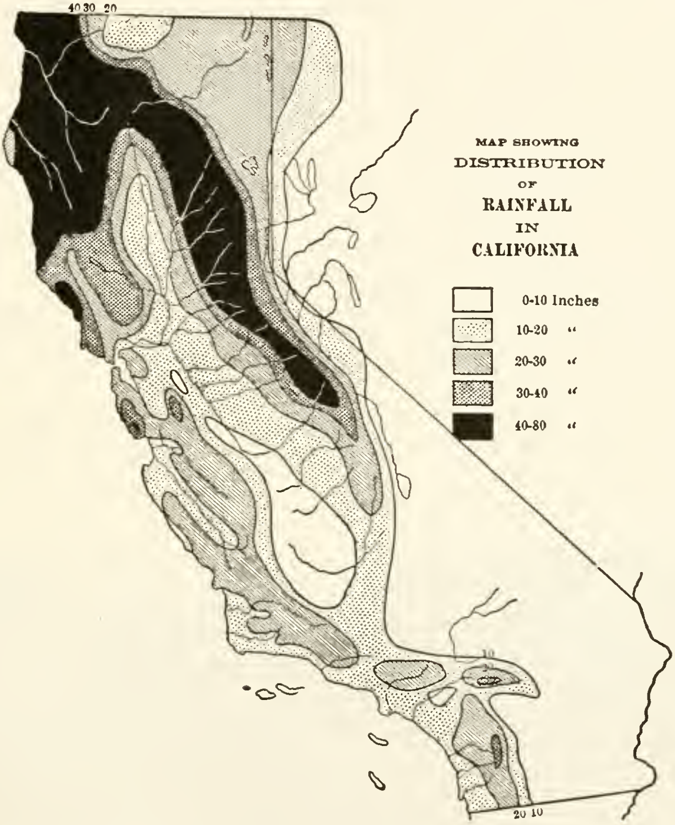
Because the surface of California is so varied, because there are many high mountains whose tops are cold, because there are lowland valleys where the sun strikes very hot in summer, because there are coast lands cool and moist from the sea winds, one may find here almost any sort of climate he wishes.

As a result of the many sorts of climate there is grown here a greater variety of fruits, nuts, vegetables and grains than in any other country of the same size in the whole world.

We find heavy forests in the north and upon the mountains. In the southeast there are deserts where little grows. In the warmer valleys we find oranges, and even dates, and in the cooler ones all the fruits of the temperate climes.

How is it that the early Spanish settlers found themselves at home in the climate of this region?

These early settlers came from Mexico and Spain. In both countries they were used to long, dry summers and had learned the need of irrigating their gardens with water from the streams.



Thus it was natural that in California with a similar dry summer they should know what to do and should pick places for the mission settlements and for the ranch houses where water could be had for the all-important gardens.

In how far was the climate of California new to the emigrants from the Eastern States?

As a usual thing rains fall frequently enough in the Eastern States to keep the gardens fresh so that irrigation is not necessary. There are seasons, however, when the rains do not come and the gardens dry up.

It took the newcomers some time to understand the climate of California. The summer season was found to be without rain for from three to five months. During this time the interior valleys became very hot, but the air was so dry that they did not feel the heat so much as they did in the East.

The valleys did not usually get cold enough in winter for snow to fall, although ice sometimes formed at night. On the mountains only a few miles from the valleys the climate was found to be cold with deep snows in winter.

In all the lowlands of the state, excepting the deserts of the southeastern part, there was usually rain enough to grow the common farm crops. Irrigation seemed a clumsy way of helping Nature supply a sufficient amount of water and besides it required much work. It was a long time before the emigrants came to appreciate the advantages of irrigation and to use it on a large scale.

How can we account for the vast deserts which the emigrants had to cross to reach California?

1. **The farther the valleys lie from the coast, and the more mountains there are between, the drier they are:** We will take an imaginary journey, starting at Monterey and going east, to learn what we can about this.

Monterey, like other coast places, has a mild even climate with cool, foggy winds from the sea in summer. We go but a few miles across the hills to the Salinas Valley and find ourselves already in a climate which is drier and much warmer.

A scene on the new State Highway (the Camino Real) in a beautiful valley of the Central Coast Ranges.

We next cross the Gavilan and Mt. Diablo Ranges, and descending from this elevated region, where there is an abundant rainfall, reach the western side of the San Joaquin Valley. So little rain falls here that the country has much the appearance of a desert. The reason for this is that the mountains offer a barrier to the storm clouds and winds, and take so much of their moisture that little remains for the valley behind them. We now cross the San Joaquin Valley and begin to climb the Sierra Nevadas.

The higher we go the cooler it becomes, and we can tell by the forests of great trees that much more rain falls here than in the valley.

As we approach the summit of the mountains the trees become smaller and finally disappear, leaving bare earth and rocks. The winters are as cold as in the far north and the snow lasts eight months of the year.

Far below to the east lies Owen Valley, to which we descend. Here we are behind the great mountain wall of the Sierras. The summers are hot and the rainfall is very small.

Now the Inyo-White Mountain Range has to be crossed, but the few stunted trees even on its lofty summit tell us that the Sierra Nevadas take so much of the moisture from the air that little remains for the country to the eastward.

We continue our journey and soon pass from California into Nevada. Before us for hundreds of miles stretch desert valleys and barren mountains. We have now crossed so many mountain ranges and have gone so far from the ocean that we have lost the sea winds loaded with water particles.

Unless we carry water with us we shall be obliged to turn aside in search of some one of the few scattered springs hidden away in the cañons. In some parts, especially in Death Valley, the heat of summer is so great that it is hardly safe to undertake a journey except at night.

Although we call this region a desert there is no place that does not receive a little rain. There are many curious plants and animals that have become accustomed to living with very little water.

Occasionally summer thunder storms occur and then the rain pours down so fiercely that we call them "cloudbursts." Torrents of water laden with mud, sand and even boulders sweep down the cañons for a few hours and then dry up, while their waters sink in the sands of the desert valleys.

There is no desert in California as dry as the Sahara of North Africa.

2. **Most of the storms come from a westerly direction:** We must remember in studying the climate of our state that, although there is much fog and cloud along the coast in the summer, nearly all the rain falls during the winter months.

We shall discover, if we watch carefully, that the storms generally come from the west, for in that direction the clouds first appear, but that the wind which brings the rain is a southerly one. We shall learn the reason for this a little later, but want to remember now that throughout most of the year the wind blows from a westerly direction—that is, from the sea—toward the land.

The fog which is brought in with the west wind in summer buries the coast lands and the west slope of the first range of mountains in a cool blanket, through which the sun may not shine for days, while the country on the eastern side of these mountains enjoys warm, bright sunshine.

The storms of winter also strike the western side of the mountains more severely, giving heavier rain there than they do in the valleys on the eastern side.

The storms are heavier also high on the mountains because of the cold air there, which changes more of the fine water particles to rain-drops. The farmer there may get all the rain he needs, while another farmer at the base of the mountains receives very little.

The air as it comes from the sea can carry only a certain quantity of water particles, and the more mountains there are in the way, and the higher and colder these mountains are, the more completely will it be robbed of these water particles.

The farther the moist sea air goes inland the more water it loses, until finally there is so little left that no more rain falls and the clouds disappear. This is one of the reasons why there are vast deserts in the heart of our continent.

3. **Near the coast the summers are very little warmer than the winters, but in the interior they are very hot:** The land warms quickly under the bright summer sun and cools off again when winter approaches. The great ocean behaves very differently, as you would learn if you could bathe in it some miles off the California

A glacier on the north slope of Shastina.

coast. You would there find the water uncomfortably cool at all times of the year.

Because the ocean remains at so nearly the same temperature the winds that blow across it and onto the land also have an even temperature. They make the winters warmer than they otherwise would be and the summers cooler.

As the winds pass over the land they are warmed in summer and chilled in winter. The farther they reach into the interior the hotter and drier the air becomes in summer. Thus it is that the valleys of this region that lie far from the ocean, and separated from it by lofty mountains, are not only very dry but exceedingly hot.

4. **The mountain ranges extend across the course of the winds and storms:** We have already learned that the great deserts lie behind the mountains, where the cool, moist winds do not reach. This means that the storms do not have a free passage toward the east, but that the mountains block them and make them drop so much of their moisture that the lands to the eastward are desert.

If the mountain ranges extended in the same direction as that in which the storms move, the interior valleys would be cooler and would also receive more rain. There would then be no great deserts and the pioneers would have had a much easier time in reaching California.

5. **Toward the south the mountains are higher and the storms less frequent:** If we should go northward along the coast from San Francisco through Oregon and Washington we would find that the rainfall increases and the rainy season becomes longer.

The Cascade Range lying back of this part of the coast is not high enough to break the force of the storms and the valleys of Central Oregon and Washington receive a moderate amount of rain.

If we should go southward toward San Diego we would find that it rains much less, for the winter storms are fewer in number.

The Sierra Nevada Mountains extend north and south through Eastern California for nearly four hundred miles and for much of this distance are more than twelve thousand feet high.

To the east and south of this range, which, together with other mountains, cuts off the sea winds and storms, are the driest and hottest deserts in the United States. Death Valley, the Mohave, and Colorado Deserts could tell many stories of suffering and death.

Why the south wind brings rain.

We have learned that the winds commonly blow from the ocean toward the land and that the storms come from the same direction. Then why do we say that it is going to rain when the south wind blows, since the storms come from the west?

The ocean of air at the bottom of which we live is always in motion. The main current in this ocean over California is from the sea toward the land. When a storm appears drifting in from the ocean with this air current the air about this storm is very much disturbed and blows from different directions. It has a whirling motion similar to the motion of a dust whirl.

The whirling air which sucks up the column of dust behaves exactly like one of our winter storms. The only difference is that the dust whirl is small and carries dust, while the storm carries rain and spreads over many hundreds of miles.

We say it is going to rain when the "south wind" blows because we feel the wind first from that direction as a storm approaches.

The rainy season is longer and the storms more frequent in the north than in the south.

Why is it that latitude has so little to do with the climate of California?

The latitude of a place is its distance north or south of the equator. The farther we go from the equator the cooler the climate ordinarily becomes, because the sun does not rise so high and thus gives less heat to the land.

California stretches a long distance from north to south, covering many degrees of latitude. We should expect for this reason that the northern part would be much colder than the southern, but this is not so. Oranges grow as well in the northern end of the Sacramento Valley as they do at San Diego.

This is because the winds that blow across the Japan Current and onto the land have almost the same temperature the whole length of the state. They make the lands of the south cooler and those of the north warmer than they otherwise would be.

One of the highest peaks of the Sierra Nevadas; Mt. Ritter, from near the timber line.

If we should measure along the Atlantic Coast southward from New York a distance equal to the length of California we should find that, while in New York it is very cold in winter, at the southern end of the line oranges and vegetables are growing in the open air.

This is because the Eastern States do not have the tempering winds from the sea to modify the natural climate which latitude gives.

Why do we give the name "Great Basin" to the deserts of Eastern California and Nevada?

When the early explorers first entered the desert region between the Rocky Mountains and the Sierra Nevadas they were surprised to find the lakes with no outlets and the water filled with salt and soda.

We speak of a river basin as including all the land that slopes toward one river, but such is not a true basin, for the water flows out at one side. In this strange desert the explorers found hundreds of true basins, each with a rim of high land all around it.

General Fremont gave the name "Great Basin" to all this desert region because he found it to be a true basin with a rim of higher land extending completely around it. No rain that fell within the slopes of this basin could ever reach the ocean.

If it should rain in the Great Basin as much as it does along the coast of California the little basins would fill up and form lakes. The higher lakes would overflow into the lower ones and finally so much water would gather in the latter that they would break over the outer rim of land and send rivers away to the sea.

It rains enough now to form a number of lakes, such as Honey, Mono and Owens, but not enough to make them overflow. Because they have no outlets the most of them contain so much salt, soda and other minerals that no fish can live in their waters.

Long ago it rained more than it does now and some of the lakes overflowed and their waters became fresh. The largest of these was Great Salt Lake, which overflowed into the Snake River in Idaho.

What can we learn as to the dangers of the desert from the Death Valley expedition?

In 1849 a party of emigrants, thinking they could reach California and escape crossing the Sierra Nevada Mountains, sought out a new way, far to the south of the main overland trail. They turned south of Great Salt Lake and made their way across Southern Nevada. They knew nothing of the mountains and deserts to be crossed or where they could obtain water and forage for their stock.

At last they reached what we now call Death Valley in a famishing condition. The most of their cattle had died and they could go no further without help. They thought the mighty Panamint Range which rose in front of them might be the Sierra Nevadas. If so they would soon come to water and green meadows, while the fertile valleys of California would lie just beyond.

Men went ahead to explore, but found that two rugged mountain ranges still remained to be crossed before reaching the longed-for Sierras. One man finally reached a ranch in the mountains far to the southwest in the direction of Los Angeles and came back with help to rescue those remaining alive.

What do the troubles of the Donner Party tell us as to the climate of the high mountains?

In the late fall of 1850 a party of emigrants reached what we now know as Donner Lake, high on the eastern slope of the Sierra Nevada Mountains. Their farther progress was blocked by cold and snow and so they made a permanent camp, hoping to be rescued or that they might live through the winter until spring. Fifty miles more and they would have reached the sunny valley of California where snow and cold were unknown. Their food gave out and before rescuers reached them many had perished.

Thus we learn that on the high mountains of California, within a few miles of where oranges are hanging on the trees, there is an almost Arctic climate.

To be caught unprepared in the cold and snow of the mountains is almost as dangerous as to attempt to cross the deserts of the Great Basin without first learning where the springs of water are.

Although the mountains formed a serious barrier to the early settlers, yet they have such an important influence upon the climate that without them California could never have become a rich garden.

1. **The mountains give variety to the climate and productions:** We have already learned that the high mountains of California have a cold Arctic climate, while the valleys at their base are almost tropical. Part way up the slopes the climate is neither hot nor cold and is the most healthful and delightful in all the world.

In ascending the mountains we pass through all the different kinds of climate which we would in the long journey from Southern California to Alaska. The many sorts of climate enable us to grow a wonderful variety of products.

2. **Because the mountains cut off the cool ocean winds the interior valleys are very warm:** On the coast there is but little difference in the temperature between summer and winter. The farther we go from the ocean and the more mountains we cross the hotter the valleys become in summer and colder in winter. This also adds to the variety of products which can be grown in California. Many plants do not thrive near the coast, while they do well in the interior.

3. **The mountains take so much rain from the clouds that the far interior valleys are deserts:** The mountains affect the rainfall as well as the temperature of the air. There would, perhaps, be no deserts if the mountains lay parallel with the direction of the winds and storms instead of across it.

A mountain lake of glacial origin on the head of the South Fork of the Merced River.

The deserts are, however, not waste and useless land. Where water can be obtained for irrigation they produce abundantly.

4. **The mountains add much to the yearly rainfall:** We have doubtless all discovered that storms are heavier on the mountains than in the valleys. The cold air of the high lands changes to rain or snow water particles which, if it were not for the mountains, would float on easterly and give little or no rain.

The mountains, then, add greatly to the rain or snowfall and this in turn supplies the streams whose waters are so much needed for irrigation in the lower valleys.

5. **More rain falls on the western than on the eastern slopes of the mountains:** Since the storms come from the ocean the western slopes of the mountains receive the most rain. This is a fortunate thing, as the western slopes of nearly all the ranges are long and gentle, affording much more land suitable for farming than the eastern slopes.

6. **If there were no mountains a large part of California would be an uninhabitable desert:** Just how important our mountains are we learn most clearly from a study of Southern and Eastern California. The rain and snowfall upon the higher mountains of this region is very heavy, and numerous permanent streams fed by springs and melting snows flow down their slopes.

The rainfall in many of the valleys is so small that most crops do not grow well without irrigation. If it were not for the moun·

tain streams we would find in place of the hundreds of square miles of luxuriant gardens and orchards only the uncultivated desert wastes.

SUMMARY.

The journey to California either by water or land, was long and dangerous. The explorers and pioneers endured great hardships in opening new trails through a vast unknown land of deserts and mountains. There were four main overland trails whose routes were determined by the mountain passes, the springs and forage for stock.

The early navigators had difficulty in exploring the California coast. The land traveler was equally hindered by the fact that the mountains came close to the ocean. The coast has, however, not always offered the present obstacles. The land has been moving up and down and was once so much higher than now that most of the present islands, which rise from a submerged plateau, formed a part of the mainland.

The two main routes to the mines were the Great Salt Lake trail, used by those who crossed the continent, and the Sacramento River, used by those who came by water and landed at San Francisco. Nature had made it so difficult to reach the mines by other routes that few attempted them.

As a result of the presence of many lofty mountains, the position and direction of these mountains, and the fact that the winds and storms generally come from the ocean, California has a more varied climate than any other land of equal size.

The climate has been an important factor in the development of the state. The long, dry summers made irrigation necessary in many parts, and as soon as its advantages were understood luxuriant gardens spread over the valleys which Nature had left so dry and desert-like.

REVIEW QUESTIONS.

Why is exploration of the desert particularly dangerous?

What difficulties are met with in exploring in the mountains?

Read and tell the story of General Fremont's journey in mid-winter across the Sierra Nevadas.

Why do trails and wagon roads use mountain passes?

Describe the route of the Great Salt Lake trail.

In what way was the Santa Fe trail more difficult?

Why is the entrance to San Francisco Bay difficult to discover from the ocean?

Why is the bottom of the ocean so much smoother than the land?

What parts of California would be flooded if the land should sink one thousand feet?

Using the relief map, make a sketch of the California coast when the land stood one thousand feet higher than now.

Describe some delta that you have seen.

Describe a journey from Los Angeles to Bakersfield.

Why was it so difficult to reach California from Oregon?

Tell from your own observations if the rains always fall when the garden needs them.

What are some of the advantages of irrigation?

Mention some of the differences between the climate of California and that of the Eastern States.

Tell what you can about the climate of the mountains of California.

Describe some desert that you have seen or read about.

Tell what you can about a "cloudburst."

How do people manage to live in the desert where there is no water?

Tell how the sky changes as a storm approaches.

What is the difference between fog and clouds?

What time of the year is there the most fog on the coast?

Is there any fog in the interior valleys, and when?

In what general direction do the California mountains extend?

How would the climate of Death Valley change if there were no high mountains between it and the ocean?

Where are the highest mountains in California?

If the highest mountains were near the coast, what would be the effect on the climate of the Great Valley?

If the winds blew from the land, would there be any oranges raised in Northern California?

What part of California receives the most rain? What the least? Describe the vegetation in each of these places.

Describe some dust whirl that you have seen.

What is meant by the "equator"? And point out on a globe the position of California with reference to it.

Describe some stream basin that you have seen.

How does the Great Basin differ from a stream basin?

What becomes of the water that is flowing into lakes without outlet?

In what part of California do oranges grow at the foot of snow-capped mountains?

Mention different ways in which mountains affect the climate of your home.

How does the ocean affect the climate where you live?

PRACTICAL LESSONS.

It is dangerous to depend upon a map which is not correct.

A coast with few bays is more difficult to explore than one with many bays and islands.

A new land is more easily reached if there are waterways leading to it than if the journey has to be made by land.

Deserts, lofty snow-covered mountains and dense forest jungles form the greatest obstacles to travel.

The shore line is not always the true edge of a continent.

One is much surer of raising a crop if he depends upon irrigation than if he depends upon irregular rains.

A land over which the ocean winds blow has a more even climate than one where the winds blow from the land to the ocean.
A mountainous land has a much more varied climate than a level land.
True basins are found only in those lands where little rain falls.
Nearly all deserts receive some rain and contain plants and animals.

Oak forest in the Coast Ranges south of San Francisco. Camp ground at Crystal Springs.

CHAPTER III.

Topic I.—The Natural Resources of Our California Garden.

Introduction.

By **Natural Resources** we mean the soil, the minerals, the forests, the water and the animal and bird life. We mean, in other words, those gifts of Nature which make it possible for the people of a country to become rich and prosperous.

The land was filled with wild animals and birds.

When the pioneers came they found California filled with a great variety of wild animals and birds. Now the larger animals have become so scarce that most of us have never seen them in their homes.

The grizzly bears have gone from the thickets where they used to be so abundant and no wild ones are known to exist in the state today. To see even a brown bear we have to go into the remoter parts of the mountains.

The antelopes no longer roam the valleys where the early settlers saw them in countless numbers. At the present time only one small band remains in western Fresno County.

The elk were once abundant over much of the state. A few still roam the wilder parts of the Northern Coast Ranges, while a partly domesticated band has been protected in the hills west of Bakersfield.

In the Spanish days the deer were very thick and were easier to approach than the range cattle. The deer are still found in the mountains, but their numbers, except in the National Parks, where they are protected, are decreasing year by year.

There are many predatory animals, such as the mountain lion, wildcat, coyote, fox, coon, etc. The mountain lion is one of the worse enemies of the deer and young stock and a bounty has been placed upon its head.

The coyote kills many young stock, but is too cunning to be exterminated. Since its numbers have been reduced, the jack rabbits and ground squirrels have become numerous and very destructive to crops.

Wild geese and ducks once stopped in California in such countless thousands during their migrations that it was thought hunters would never reduce their numbers. Although they are numerous still, especially in the Sacramento Valley, where they are attracted by the rice fields, they must be protected or they will eventually become extinct.

Most of the game birds, song birds and shore birds are still with us, and are so well protected by law that we shall not lose them.

A few thousand years ago California was inhabited by many strange animals and birds different from any living here now. Some of the animals were huge and fierce, like those of the tropic jungles in distant parts of the world.

We should never have known much about these if it had not been for a group of tar springs near Los Angeles. The animals used to come to these springs long ago to taste the salty and alkaline water. Many of them fell into the sticky tar and died. The tar preserved the bones and now thousands of skeletons have been dug out, many of them in an almost perfect condition.

Among the animals that have been found are the elephant, mastodon, camel, llama, tapir, buffalo, lion, tiger, and rhinoceros, besides many smaller ones, and some birds.

Our forests are unequaled in all the world.

Every one has seen or read about the "Big Trees" of the Sierras and the redwoods of the Coast Ranges. But these are only two of the many kinds of cone-bearing trees forming the magnificent forests of California. Among our important trees are the sugar pine, yellow pine, spruce, fir, and cedar. Forests cover all the mountain slopes except the higher ones, where it is too cold, and the lower ones, where it is too dry.

There are two main arms of the forest belt. One covers the Sierra Nevadas, the other the Coast Ranges north of Santa Cruz. The two arms unite in Shasta County and extend through Oregon and Washington into the far north.

The lower mountains and valleys, where there is rain enough, are covered with a scattered growth of beautiful oaks of different kinds. The oaks give the valleys a park-like appearance.

The **wild flowers** are remarkable for their variety and brilliancy. The unplowed valleys are covered in spring with flowers of many colors. Most prominent among these is the orange poppy, the state flower.

Why is it that California has such a variety of plant and animal life?

1. **California lies between very warm and very cold lands:** We have learned that Northwestern California has a very heavy rainfall and a dense vegetation, and that the southeastern part is a desert, because it has so little rain. We have also learned that the coast climate is mild, both winter and summer; that the interior valleys are hot in the summer, and that the higher we go on the mountains the colder it becomes.

The greater part of California has the climate of the warm temperate belt. By this we mean that it is neither too hot nor too cold, but that the temperature and rainfall are suited to the most comfortable, healthful life and the growing of the greatest variety of products.

2. **California stretches for many hundred miles along the Pacific Ocean:** The length of California is about three times its width, and it stretches from northwest to southeast through ten degrees

of latitude. Because it is so long from north to south we should expect the climate of the north to be much colder than that of the south, but in reality there is little difference.

3. **The prevailing winds blow from off the ocean:** The mild climate of California is due to the fact that the prevailing winds blow off the ocean. The ocean changes very little in temperature throughout the year, and therefore the winds which blow from it have a mild and uniform temperature. The cool Japan Current which flows southerly along the coast warms very slowly, so that the average temperature at San Diego is only little above that at Eureka.

Because California lies lengthwise to the ocean, a larger part is affected by the ocean winds than if it were narrow on the sea and long from east to west. The many mountain barriers, however, which the winds encounter make their influence felt a much less distance inland than it otherwise would be.

If the winds blew from the land toward the ocean, as the prevailing winds do in the Eastern States, we should have a climate hot in summer and cold in winter. We should have a **continental climate** instead of a **sea-coast climate.**

4. **California has a varied surface:** There are valleys like the Sacramento - San Joaquin, so large that we might truly call them plains, where an abundance of water produces a luxuriant vegetation. There are desert plains which for lack of water must always remain barren.

There are gentle hill slopes, inclosing thousands of beautiful val-

A party of teachers on the summit of Mt. Whitney, the highest land in the United States outside of Alaska.

leys blest with everything that Nature has to offer. There are coastal plains and mesas with a character of their own.

There are steep hills and mountain slopes, the home of our magnificent forests. There are mountain valleys, plateaus and table lands suited either for pastures or farms. There are high mountain valleys where it is so cold that only grasses will grow.

Over all, bare rocks and picturesque crags rise thousands of feet in a clear, cold, arctic region with an arctic climate.

5. **California has the highest land in the United States outside of Alaska:** Mount Whitney, the highest peak of the Sierra Nevada Mountains, rises 14,502 feet above the sea. There are many other peaks almost as lofty. At this great height only a few stunted arctic plants are found.

6. **California has the lowest land in the United States:** From the top of Mount Whitney, the highest land, we can almost look into Death Valley, the lowest and hottest land in our country. This valley is 276 feet below the level of the sea. Only one other desert in the world is lower and that is the Valley of the Dead Sea in Palestine.

Far to the south of Death Valley lies the Colorado Desert, the lowest part of which is known as the Salton Sink, 260 feet below the sea level. This sink, which was once occupied by a salt marsh, has been flooded by an overflow from the Colorado River and is now a large lake.

The heat of these deserts which lie below the level of the sea is almost unbearable in the summer and many people have perished attempting to cross them at that season.

7. **California has many kinds of rich soil:** The soil comes in the first place from the crumbling of the rocks. There are so many kinds of rocks in our state that we should expect to find many kinds of soil. Among these we may mention red volcanic soil, sandy granite soil, sandy loam and heavy clay or adobe soil.

There is the soil formed directly from the crumbling rocks on the hill and mountain sides. There is the soil in the valleys which has been washed from the steeper slopes and is deeper and richer. There is the soil of the deltas of inexhaustible fertility. There is the soil formed on what was once the bed of the ocean or of dried up lakes which often contains much salt, soda and other alkalies.

How has the distribution of the rainfall and vegetation influenced the settlement of California?

The early Spanish ranchers came from Mexico, where they were dependent upon irrigation to raise their crops. That country has few trees and they lived in homes made of "adobe" bricks or stone.

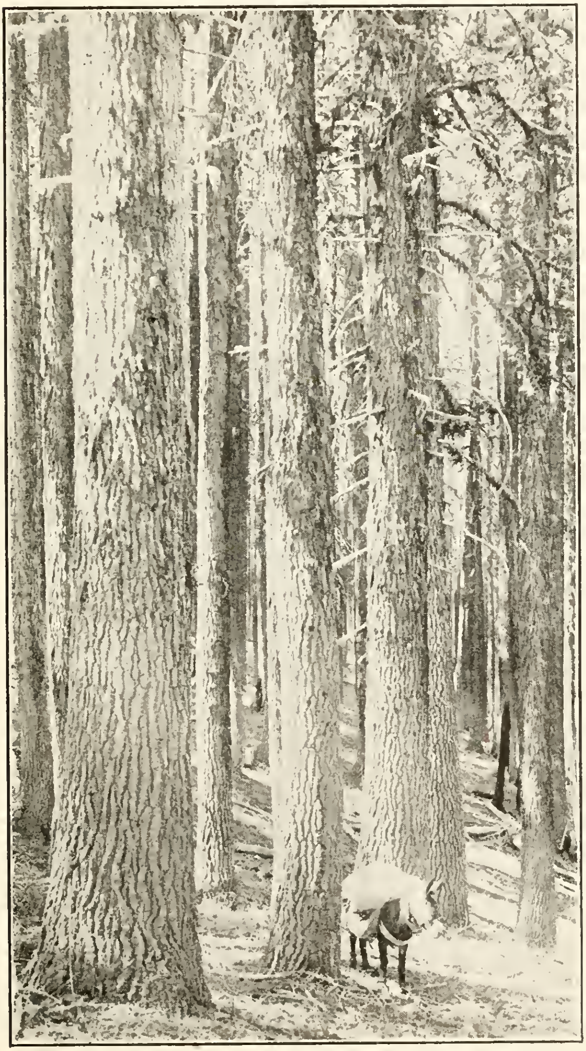
These people felt at home in the drier valleys of California, not minding the absence of trees if there were only water for irrigation.

The emigrants from the East were accustomed to summer rains and to homes built of logs or lumber. They distrusted the treeless parts of California and settled for the most part in the northern valleys where there was more rain and timber. It was not necessary for them, however, to clear the forests, as their ancestors had done in the East, for there was an abundance of open land.

How the distribution of vegetation affected the industries.

The hilly and mountainous part of the state outside the main forest belt was found to offer the best pasturage for cattle. For many years the Coast Range region was one vast cattle range, for it is well supplied with wild grasses and other forage plants.

Sheep were ranged in great bands all over the state from the forest regions to the deserts and from the valleys to the summits of the mountains. After a time it was found that the sheep were doing great injury to the young trees and destroying the protecting cover of the soil so that it began to wash. Now their ranges are much restricted.


A forest of white fir on the slope of Mt. Shasta.

Dairying first became important in the cool, moist valleys of the Coast Region where the grasses remain green longest. The mountain valleys were also valued by the dairymen, for there the meadows were green all summer and the cool air is favorable to butter making.

There are now many dairies in the warm, dry valleys where alfalfa is kept green by irrigation and the air of the dairy-houses is cooled with ice.

The grain farmer sought the great open valleys where he did not have to do any clearing of the land and he could plow furrows miles in length.

The first saw-mills were built in the Coast Ranges where boats could carry the lumber to San Francisco, and in the Sierras at points near the mines. For a long time there were few roads and the mountain streams were generally too rocky and swift to float the logs down to the valleys, and so it was only the easily accessible timber that was cut.

Saw-mills have now been built far back in the mountains. Railroads bring the logs to the mills, and flumes float the lumber down to shipping points in the valleys.

Has mining or farming helped most to build up California as a land of pleasant homes and gardens?

Most of the pioneers came expecting to get rich quickly and then go back to their old homes in the East. Having no idea of staying in this far-away land they put up cheap and temporary habitations.

The mining settlements changed from month to month. As soon as the placers in the vicinity of any town were worked out, most of the people moved away to other places.

Many of the old-time mining towns have completely disappeared. We find everywhere tumbled-down houses and stone chimneys standing alone. The population of the foothill counties of the gold belt, although now increasing, is still much less than it was during the mining excitement fifty years ago.

In the search for gold the value of the soil was not thought of. Thousands of acres of rich bottom land along the streams were turned upside down and left a mass of barren boulders.

Finally the importance of mining became less and that of agriculture increased. The wonderful richness of the soil and the healthful and agreeable climate led more and more of the new-comers to take up farming and make their homes in the new land.

The miner and lumberman go to a new country with a different purpose from that of the farmer. They expect to remain only so long as there are minerals in the ground or trees to be cut. The farmer builds a permanent home and surrounds himself with as many comforts as he can, for he expects to remain. The farmer tries to improve the fertility of the soil, instead of robbing it of its plant food, for his living depends upon it.

Although mining has been, and still is, the source of much of our wealth, yet it is not such a lasting industry as farming. It does not leave the country permanently richer as farming does.

What are the most important minerals found in California?

For many years California was known only as the "Land of Gold." Finally many other valuable minerals were discovered and now the production of petroleum is so great that we might truly call it the Land of Oil.

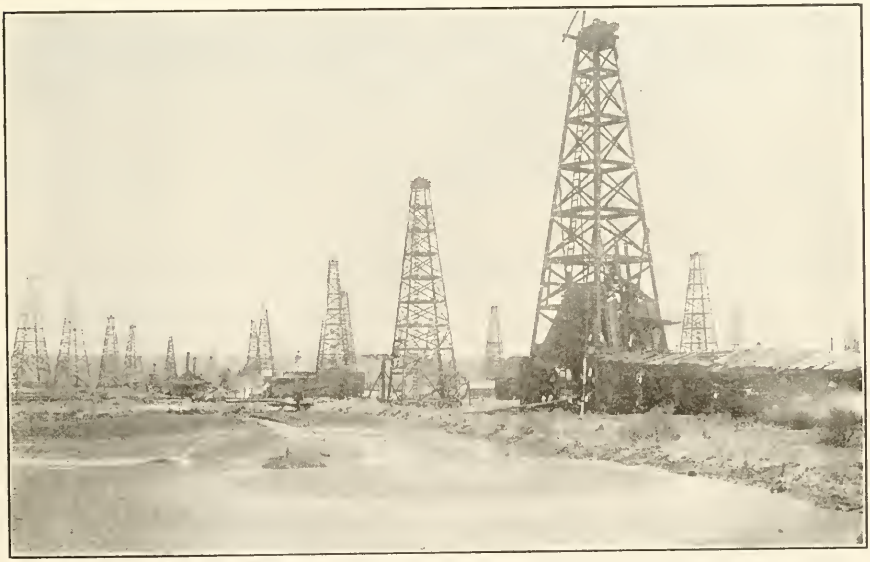
There are several methods by which gold is obtained. The first used is the simplest. It required only a pick and shovel, a few pieces of board, some nails and quicksilver. This method is called **"placer mining."**

Most of the gold was found on the **"bedrock,"** at the bottom of the stream beds. To get it the top gravel was shoveled off and that at the bottom put through a **rocker** or **sluice** and the gold which it contained was collected by the aid of quicksilver.

After a time gold was found at the bottom of very thick beds of gravel which formed the channels of streams that flowed long ago. This gold was too deep to be reached with pick and shovel and so the miners made use of water. They brought it in pipes under great pressure and turned it against the banks of gravel. The stream was larger and more powerful than that from a fire engine and rapidly washed away the gravel so that the gold could be obtained. This process is called **hydraulic mining.**

Last of all came **quartz mining,** by means of which most of the gold is now gotten from the earth. The miners traced the gold found in the **placers** back to its original home in veins of quartz extending through the rocks. To reach this gold shafts have to be sunk or tunnels run into the hillsides. Some of them extend nearly a mile into the earth.

When gold became more difficult to find, other minerals were sought for. Through nearly all the mountains of Eastern California veins of silver and lead were discovered. Great beds of copper ore were found in many places, particularly in Shasta County. Here also are beds of iron. In the Coast Ranges valuable quicksilver de-



In the Kern River oil fields.

posits have been worked for many years. Valuable deposits of salt, soda and borax occupy the beds of the dried-up lakes in the deserts.

How is it that California has so little coal, but such valuable deposits of petroleum?

The story of coal is not at all like that of petroleum. Where we find beds of coal there were once marshes and swamps in which vegetation grew rankly. The decaying leaves and stems collected in thick layers, which after a time were deeply buried in the earth and there changed to coal. California has but little coal and that not of the best quality.

Petroleum comes from bodies of minute sea animals and plants which collected on the bottom of the ancient ocean once covering Western California. When after a long time the beds containing these bodies had been turned to rock, they were lifted above the ocean to form dry land.

Then, when prospectors found springs of gas and oil issuing from these rocks, they drilled deep holes in the earth nearby and struck the deposits of these valuable substances buried far beneath the surface.

Petroleum, or oil, as it is commonly called, is obtained at many points in the Coast Ranges, along the borders of the San Joaquin Valley, and in Southern California. It now forms the most important mineral product of the state. Single wells have produced as much as fifty thousand barrels of oil in a day.

What effect did the discovery of oil have on manufacturing?

The growth of manufacturing in California has been slow. One of the chief reasons for this is the lack of cheap coal of good quality. Most of the coal used had to be brought a long distance either by ship or railroad. This made the price so high that it was difficult to carry on many kinds of manufacturing and compete with the Eastern States, where coal and labor were cheaper.

The discovery of vast deposits of oil suitable for fuel has made a great change. Oil has replaced coal in engines of all kinds because it is cheap and can be used for nearly every purpose where coal is used.

TOPIC II.—The Natural Resources of Our California Garden Are Very Rich, But They Will Not Last Unless We Take Care of Them.

Introduction.

California is becoming one of the most important states in the Union because of its great area and the richness and variety of its resources. We must, however, learn to use these gifts more wisely than we have been doing. We have cut and burned the forests; we have overstocked the slopes, causing the soil to wash away, and we have almost exterminated some of the useful animals and birds. We have done these things not thinking of what the results will be.

We shall have to learn to do differently or Nature will punish us, as she has punished people of other parts of the world who have wasted their resources.

What do we mean by *Conservation,* and why is it of special importance to California?

By **Conservation** we mean the careful use of our natural resources so that they will remain as rich and abundant for our children as they are for us.

Conservation is especially important in California because of the long rainless summers, which make it necessary to save the water, to guard against forest fires and protect the surface from being washed by the rains.

The need of water in the summer.

We know that when it rains the water runs away quickly from bare, rocky slopes and almost as quickly from hard, bare ground. Where there is soft earth covering the rocks a part of the rain-water sinks in and less runs away. If the surface is covered with a growth of bushes and trees a still smaller amount of water runs away, for the decaying leaves and branches form a carpet over the surface like a sponge. This decaying vegetation we call **humus.** The water which the humus holds finally sinks down into the crevices in the rocks and feeds the springs.

The high mountains are the homes of the heaviest storms. The amount of rain or snow that falls upon them is much greater than that which falls in the valleys.

If we would have water for summer use we must leave these mountain slopes undisturbed. We must see that the forests are not cut away. We must see that the meadows are not destroyed by cattle and sheep. We must take care in plowing and cultivating the soil that we leave it in such shape that it does not wash during the winter storms, or our country will become dry and barren.

What is the result of the careless treatment of the surface of our California Garden?

1. **The rains wash the soil from pastures where there are too many cattle:** In our walks over the hills we have seen here and there how the rain-water is cutting deep gullies in the soil. Some of the gullies start in old roads and trails. Many others appear in the pasture lands where there are so many cattle that the grass is eaten into the ground and the surface tramped hard. The destruction of the grass permits the water to get at the soil and it soon begins to cut channels which grow larger with every rain. The muddy torrents which we see during a heavy storm tell us that the soil is being carried away.

2. **Careless farming of the hillsides causes loss of the soil:** When we clear the trees and bushes away and plow the hillsides we must use care to keep the soil from washing. We should either

keep the surface loose so that the water will soak in or grow some crop upon it which will prevent the water from carrying away the soil.

It would be better if we left the steeper hillsides covered with the protecting plants which Nature placed there.

3. **The earth washed from the slopes fills up the streams and bays:** When too much sand and mud are washed into the streams they cannot carry it all away and their channels begin to fill up; we can learn this from any little torrent formed during a rain. When the channels become filled the waters overflow their banks and wash mud and sand onto the adjoining fields.

Navigation of the Sacramento River is more difficult than it used to be because of the earth washed into it from the hydraulic mines.

Many little arms of San Francisco Bay are slowly being filled by the mud brought down by the streams that enter them.

Some of the small bays along the coast have been nearly filled in this manner since the state was settled. Morro Bay is a good example.

What is the final result of wasting the soil?

The loss of soil finally changes a fruitful land into one which is barren and desert-like. When the vegetation which once clothed the surface has been destroyed, the soil is left unprotected. The water gathers in rivulets and runs away quickly, tearing out gullies. The ground dries and the springs become smaller.

We can see all over California how water has been at work upon the soil. Our careless plowing, thoughtless waste of the for-

Scene in the San Mateo hills south of San Francisco showing how the rain washes the soil when cattle kill the grass covering.

ests and over-stocking of the ranges has not only injured the soil upon which the most of us depend for a living, but has in some places decreased the summer water supply.

Where are our forests mostly found?

Our forests are found wherever there is an abundant rain or snow-fall and the climate is not too cold. If we study the rainfall map of California and trace the boundaries of that color which marks thirty inches or more rain we shall obtain a pretty good idea of where our forests lie.

In the northern part of the state the lowlands receive thirty inches or more rain and are covered with forest trees. As we go south the rainfall in the valleys becomes less and we have to ascend the mountains to find a region where it rains enough to grow forests.

In Shasta County the yellow pine, one of the most important of the lumber trees, grows as low as 1000 feet above the sea. When we have gone as far south as San Bernardino County we find that we have to climb up to an elevation of 5000 feet to reach the yellow pine forests.

The distribution of our forests is, therefore, determined by the rainfall. The rainfall is so small in the valleys of the southern half of the state that there would be no forests in this region if it were not for the lofty mountains.

The value of our forests as sources of lumber and fuel.

The forests of California are among its most important resources. If we use these forests with care we shall have not only enough for ourselves and our children, but to sell to the people of other countries.

The waste in our forests from fire and careless cutting amounts to a very large sum every year. We waste more than we use. If we could only see how people in many other parts of the world suffer from the lack of both fuel and material for building their homes, we would appreciate more the wealth which we have in our forests.

How our forests protect the soil and aid in holding back the rainwater for summer use.

1. **Roots hold the soil so that it does not easily wash away:** If you will examine any bank by the side of a road or along a stream you will find that the roots of the trees and smaller plants form a perfect network for perhaps two feet downward from the surface. In some places you will see that the earth beneath the root layer has crumbled and fallen away, leaving the top overhanging. This shows how strongly the roots protect the surface. In places where there is no vegetation at the top of the bank you will notice that it is no longer steep, for the top has washed away.

2. **The leaf mold and humus aid in holding the water:** If during a rain you will walk out into the open fields and then into the woods, you will see that there is much less water running down the

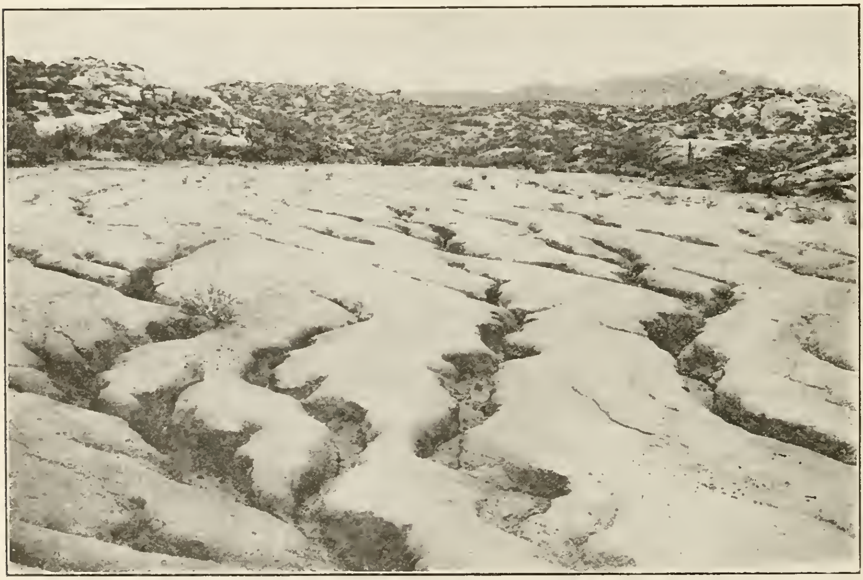
slopes in the woods than there is in the open fields. The water that does run away from the wooded slopes is clear, while that which runs off of the cultivated lands is muddy. The layer of decaying wood and leaves lying under the trees takes up the water like a sponge.

3. **Where there are forests the flow of the springs is larger and more even:** If we will go into the hills we shall see that the streams start in little springs at the head of small ravines. These springs are fed by the water which seeps down through the crevices in the rocks from the layer of humus and soft earth spread over the surface.

Where there is little rain, as in the desert, there is only a small amount of humus and soil over the rocks. When the rain comes the water runs quickly off and gathers in torrents in the cañons. There are few springs in the mountains of the desert partly because there is so little covering over the rocks.

4. **If the mountain slopes are left as Nature made them, the danger of floods is less and the flow of the streams is more even:** We suffer from floods in the winter and early spring in nearly all parts of the state. These floods have their start in the mountains where the slopes are steep and the storms heavy. Anything which disturbs the surface so that the water will run away more quickly will make the floods worse and leave less water for summer use. The more perfect the sponge-like covering which the forest helps to form, the less danger there is of sudden flood.

We should, then, use every care in the management of our mountains. We should take care of the forests that we may always have



What the water has done to the soil in Southern California where the protecting bushes have been killed.

lumber and fuel. We should see that the layer of humus, or **leaf mold**, is not destroyed through the stripping off of the forests or pasturing the slopes too closely. The time may come when, if we are careless, as people have been in other countries, our California garden will be poor and barren.

What has happened in other countries where the forests have been destroyed?

We will take an imaginary journey to some far-away countries on the other side of the world and see how poor the people are in many places. We will visit Spain, Italy, Palestine and China. The people in these lands have been cutting down their trees for thousands of years regardless of the troubles which they were bringing upon themselves. Their forests are nearly gone and the best of the soil has been washed from the slopes, which are gullied and torn; and the valley lands have been injured by the mud, sand and boulders which the floods have left upon them.

Fuel is so high in price and so scarce that it cannot be used to keep the homes warm in winter, but only for the needs of cooking. Women and children have to wander miles gathering twigs and small brush which they bring home on their backs.

The value of our mountain forests as parks for summer recreation.

No other part of the world has a finer climate than the mountains of California. There are many months of beautiful weather. The air is warm, but not too warm. There is an abundance of pure water and magnificent scenery. In the shady forests of these regions are the most delightful summer camp grounds.

The map shows what a large area in California our Government has included in the National Forests and reserved from sale. These are free for us to camp in if we are careful about fire.

There are in the Sierra Nevada Mountains, in addition to the National Forests, the Yosemite, Sequoia and General Grant National Parks where no trees can be cut nor wild game killed.

In the Coast Ranges we have Sempervirens Park and Muir Woods, and other beautiful camp grounds where the primeval forests will be left as Nature made them.

If it were not for the forests our mountains would be without much of their present attractiveness and we would not care to spend our vacations in them.

We may say, then, that for the encouragement of healthful outdoor life, if for nothing else, large areas of our forests should be left in their wild beauty. To the many thousands of people who go into the mountains in the summer, the forests are of far more value than if they were cut down and made into lumber.

The value of the trees as homes for the birds.

Many kinds of birds use the trees for nesting places. If most of the trees were cut down the birds would leave us. Although a few birds are destructive, almost all of them do far more good than harm. They eat large numbers of insects which injure our fruit trees and gardens. Besides this, the birds make beautiful music which we should miss sadly if they were gone.

The wild life of our State.

1. **Shall we permit the wild animals to be exterminated?** There are many wild animals, such as the deer, antelope, elk and mountain sheep, which do no harm, while they add much to the pleasure of out-door life. Laws have been passed to protect these animals and we should see that they are strictly enforced.

The numbers of the predatory animals, among which are the California lion or cougar, the coyote, wildcat, besides other smaller ones, can be easily kept down by hunting, so they can do little harm.

In order to prevent the extinction of wild life still remaining, the National Parks have been made **game preserves.** No guns are allowed in them and the animals live their natural lives without fear from men.

The wild life has been further protected by the establishing of **closed seasons.** Deer, for example, can be hunted only two months in the year, and the number that can be killed by one person is limited to two bucks.

The fish of the streams, lakes and ocean are an important source of food, but because of the selfish and destructive methods employed by many fishermen laws have been made governing the time and manner in which fish may be taken.

The effect of fires on the forests at the head of Tejunga River, San Gabriel Mountains, Southern California.

The great value of bird life.

Because of the thoughtless, selfish and cruel treatment which many people give the birds, it has been found necessary to protect them also, by very strict laws, to prevent many species from being exterminated.

Ducks, geese, quail and some others are known as game birds and are hunted for food. Many of the water and shore birds have been hunted for their plumage. The owls, hawks and some of the song birds have been hunted because of the damage they were supposed to do.

As a result of the examination of the crops of many different kinds of birds it has been learned what sort of food each takes. Many live almost wholly upon insects. Others live partly upon insects and partly upon fruit and grain. The birds destroy enormous quantities of insects which if left alive would do great damage to our fruit trees and gardens. Many even of the hawks and owls, which were once thought to be harmful, have been found to be very beneficial because of the mice, rats and other rodents that they destroy.

We must not forget also how much pleasure we take in the companionship of the birds. The world would be less attractive without their music.

We should take care also of our mineral resources.

Nature was a very long time in making the veins of gold, silver, copper, lead and quicksilver which we find in our state. In a few places where there are hot springs, these minerals are still being formed, but most of them were deposited long ago. When we have dug out and used all that we can discover of these valuable substances, we shall either have to do without or go elsewhere for them.

It is in the oil fields that the most mineral waste occurs. Sometimes wells cannot be controlled and large quantities of oil are lost. For many years the gas, that comes out of the earth with the oil, and is so valuable for lighting and heating purposes, was allowed to escape into the air. The loss has been more than we could calculate and can never be replaced.

TOPIC III.—How the Growth of California Has Been Affected by the Character of Its Surface, Its Streams and Its Climate.

There was little farming in the old Spanish days.

Each mission and ranch had its own garden and grain fields, but these were only large enough to supply home needs. There was no market for any products of the soil.

The vast herds of cattle and sheep which roamed the hills formed the wealth of the people. The climate was so mild and grasses so abundant that they required little attention except at branding time.

The only parts of the animals that had any value were the hides, tallow and wool. These were shipped by occasional trading vessels which brought much prized luxuries in return.

Travel was slow and difficult before the building of wagon-roads.

Travel is now so easy between most parts of California that we do not realize how difficult the numerous mountain ranges made a long journey in the early days. There were then no roads across the mountains which lay between the different valleys and travel had to be on foot or horseback, over rough paths or **trails.** Many of these were old Indian trails. The Indians on their part often made use of the trails of the wild animals which in their wanderings naturally sought the easiest routes over the mountains.

Trails are much more easily built than wagon roads and can be made where the mountains are too steep and rocky for roads. Even now they are the only means by which we can travel through the higher and more rugged mountains of California. Although trails seem ill suited to freighting, yet large quantities of goods are taken over them on pack horses or mules to remote mining settlements which can be reached in no other way.

The "overland trails" were really wagon roads, although usually very rough and steep. The Camino Real, the name which we give to the great highway leading north from San Diego through the whole length of the Coast Ranges to Sonoma, was for many years merely a trail not suited for wagons.

The destructive effect of avalanches in the high Sierra Nevada Mountains.

There are two vast mountain regions in the state into which no roads have yet been built, and if you wish to see their wild and picturesque scenery you will have to go through them either afoot or on horseback.

So rugged are the Northern Coast Ranges that the first wagon road across them was not finished until 1914. This road runs from Eureka to Red Bluff.

How did mountain passes make possible the settlement of California?

If you will look at a range of hills or mountains you will notice that its crest is very uneven. There are high points, called peaks, which are often very steep. Between the peaks you will see saddle-like depressions where the slopes are less steep and often easy to cross. Low places of this kind we call **mountain passes**, or simply **passes.**

If there had been no passes in the lofty, rugged mountains which shut off California from the East, or in those mountains which break up its surface into so many separate valleys, it would have been much more difficult to build wagon roads and railroads, and our state would have remained unsettled much longer.

If there had been no gaps in the mountains separating Southern from Northern California, there would probably have been two states instead of one.

What are the mountain passes which proved of so much importance in the early days?

If we were placed among the mountains of a land that was strange to us and our lives depended upon finding a way through them, we could then understand with what anxiety the pioneers hunted for passes through the mountain ranges that blocked their paths.

The easiest and most direct route across the Sierra Nevada Mountains, although not the lowest, proved to be that by Donner Pass, and so most of the emigrants came that way.

A little to the south of Donner Pass is Carson Pass, by which some of the pioneers came, and to the north is Beckwith Pass, which was used to some extent. Although the latter is one of the easiest passes in the Sierras, yet the rough mountains between it and the Sacramento Valley offered as great obstacles to the building of a wagon road in the early days as they did later to the building of a railroad.

The lowest and easiest crossing of the Sierra Nevadas is Walker Pass, away to the south. This pass was named after a noted trapper and explorer. No emigrants came this way because of the vast Mohave Desert on the east and the impassable cañon of the Kern River on the west.

The Santa Fe trail led, for the most part, through an open but desert country. At Fort Yuma it divided; one branch going northwest across the Colorado Desert and through the San Gorgonio

Pass, and the other branch going west across the Peninsula Range to San Diego. The San Gorgonio Pass is a remarkable gateway between two of the loftiest mountains of Southern California. The Peninsula Range is rugged, with no low passes. San Diego has recently been benefited by a railroad constructed along the border from San Diego to Yuma.

The old Mormon Trail across Southern Nevada reached Southern California through the Cajon Pass. This route was but little used, for it did not lead to the mines. Although the pass is 4000 feet high, it forms a great gap between the San Bernardino and San Gabriel Ranges, two of the most difficult mountain ranges to cross in the south.

How the railroads made use of the mountain passes.

If there had been no mountain passes, the building of the overland railroads would have been delayed for many years. Without the railroads the fruit and agricultural industries would not have developed because of the impossibility of sending their products to market.

As we might expect, the first railroad to California was built through Donner Pass; the one which the pioneers had found easiest and most direct. It is so high, however, that the snow falls very deep and lasts many months. In order that the trains may be kept running throughout the winter, it has been found necessary to build many miles of snowsheds. It is now proposed to tunnel the mountains and so escape the snow as well as the steep grade over the summit.

Beckwith Pass is now used by the Western Pacific Railroad and has the advantage of being much less snowy.

Siskiyou Pass has been found to be the only practical route for a railroad through the mountains to Oregon. Both of the passes,

The new State Highway in Gaviota Pass, Santa Barbara County.

giving access to San Bernardino Valley from the east, are used by railroads. The San Gorgonio is used by the Southern Pacific Railroad and is the broadest and easiest pass leading to the Pacific Slope, for it is only 2000 feet high.

The Cajon Pass is used by Santa Fe and Salt Lake Railroads and is of much more importance now than it was in the early days.

How was the exploration of the California region affected by the fact that there are few navigable streams?

If we were exploring a new country in which there were no roads or even trails, we would find that if there were rivers and lakes upon which we could travel in boat or canoe we would make much better progress than if we had to make our way across the land.

When we study the different trails to California, that were traveled in the early days, we see that none of them made any use of lakes or rivers. The early trappers ascended the Missouri and Yellowstone Rivers, but these do not lead in the direction of California. The Arkansas River was too shallow and swift. In some places the Snake and Columbia Rivers offered opportunity for the use of rafts or boats, but they were not on the route to California.

The ocean, of course, offered an open highway to California. But for the people of the East the long sea voyage around Cape Horn, or the shorter one by the Isthmus of Panama, was more to be dreaded than the overland route.

The only navigable water ways within the state are San Francisco Bay and its branches, the short tidal streams entering these branches, the Sacramento River and its tributaries, and the San Joaquin River. These waterways made travel to the mines from San Francisco very easy, but are of no advantage to the most of the state.

We can say in conclusion, then, that the settlement and growth

Freighting on the desert before the time of the railroad.

of most of California has been much slower than it would have been had it possessed many deep bays, navigable rivers and lakes.

Farming could not become an important industry until there was some means of getting produce to market.

There would be no use in raising large quantities of fruit and vegetables if we had no means of shipping them where they were needed.

Until the building of the railroads farming and fruit growing could not become an important industry. The home market required but a small part of what the soil could be made to produce. The navigable streams emptying into San Francisco Bay reached only a short distance into the interior. Even the ocean could not be used for shipping perishable products because of the long time required to reach the eastern market.

The lack of summer rains also delayed the development of farming.

Stock raising continued for a long time to be the most important industry next to mining, partly because of a lack of market for produce and partly because large areas of the state which furnished wild forage suitable for cattle were thought to be too dry for cultivation.

The open ranges finally, however, began to be fenced; farmers spread into the drier valleys and found that good crops of grain could be grown if the seed was put into the ground early enough to get the winter rains. But it was not until the advantages of irrigation were understood that the desert valleys of Eastern and Southern California were considered of any value. In these dry regions, under an almost cloudless sky, the farmers, by the aid of irrigation, have been able to build up comfortable homes surrounded with green fields and orchards.

The period of the great grain ranches.

In studying the growth of California, we find that as stock raising became less important, the production of wheat, barley and oats increased. The larger valleys throughout the whole length of the state, wherever the rainfall was sufficient, were turned from cattle ranges into vast grain fields. In the Sacramento and San Joaquin Valleys one could ride in the spring for many miles through fields of waving wheat.

The growing of grain is still an important industry, but many of the great ranches are being cut up into smaller ones where diversified farming is now carried on.

The growing of grain did little more than cattle raising to fill our great valleys with comfortable homes. The grain ranches were large, like the stock ranches, and the homes were usually surrounded with few comforts because of the lack of water.

Farm life in California did not begin to be attractive, as Nature intended it should be, until people learned how to preserve and make use of water for irrigating the dry fields. The careful cultivation of a small piece of land with the aid of water brings a better and surer living than the poor cultivation of a large piece and dependence upon chance rains.

Irrigation has made farming the most important industry in California.

The early emigrants from the East looked upon the long, dry summers as a great drawback to farming in California. We now know, however, that this was a mistake, for they are really an advantage.

In the first place the lack of rain makes the hot climate of the interior valleys much more healthful than it otherwise would be. In the second place it is a great advantage, as we have already learned, to be able to turn the water onto the fields just when they need it. It almost seems as if Nature had arranged purposely a supply of water at a time when there are no rains. She has placed high mountains all about the valleys. The heavy storms on their summits and the snowbanks which melt slowly furnish the water needed for summer use in the valleys.

All the California farmer has to do is to build reservoirs and ditches and he can have water whenever he wishes it.

California now ships farm produce to all the world.

California offers everything to make farm life within its boundary happy and prosperous; sunny skies, water for irrigation, and a world market. It has so many sorts of climate that everyone can find a place to suit and in which he can grow what he likes best. It has thousands of square miles of the richest soil in which will grow plants from all parts of the world except the tropics.

All the markets of the world can now be reached from California. Six lines of railroad connect it with the Eastern States. The water route through the Panama Canal now leads to the East and to Europe. About the shores of the Pacific Ocean upon which California faces are half the countries of the world.

California fruits are known all over our country and in Europe. There is little danger of raising more than we can sell. The climate of half of our country is cold and the people in those parts are glad to get our semi-tropical fruits. Besides this we can supply them with other fruits and vegetables earlier in the spring than they can raise them.

Does our California garden yet produce all that it might?

Although we raise immense quantities of fruits and vegetables both for home use and for export to other states and countries, yet only a small part of the fertile lands of California are carefully cultivated.

We can travel for many miles in some of the larger valleys and see only a few well cultivated farms, where there might be thousands with comfortable and attractive homes. When the rich lands are all improved and the waters which now run useless to the sea are caught in reservoirs and turned on these lands, California will support many times its present population.

How a great aqueduct brought water to Southern California.

Stories of the ancient Roman Empire tell of great aqueducts built to supply the cities with water, but the greatest aqueduct of all time has been built in Southern California. Water is the single thing of importance which Nature has given sparingly to this region. As Los Angeles and the country about increased in population, it was seen that more water would soon be needed than could be supplied by the streams of the San Gabriel Mountains.

To obtain more water the engineers turned to Owens River, far to the northward, beyond both the San Gabriel Mountains and the Mohave Desert. This river rises in the snowbanks and lakes of the highest part of the Sierra Nevada Mountains and is finally lost in Owens Lake.

It is 260 miles from Los Angeles to the point in the river where it was decided to take out the water. The desert had to be crossed and tunnels several miles in length made through the San Gabriel Mountains. To prevent the loss of water the aqueduct was made of cement in the form of a huge tube.

With the completion of this aqueduct, the greatest in the world, Southern California will support many more people than it otherwise could.

Is there water enough to turn all our deserts into fruitful gardens?

We often think of a desert as being formed of sand and rocks, but this is only partly true. The most of the surface of our California deserts is formed of good soil which only needs water to produce abundantly. The Colorado Desert, where once travelers sometimes died of thirst, has been changed by the water brought from the Colorado River, into a luxuriant garden.

In some of the desert valleys water is found by digging wells.

Branding cattle on a desert range.

The lofty mountains along the western border of the Great Basin send down streams which supply a fringe of settlements, but the larger part of this desert region must remain a barren waste for lack of water.

The advantages of country life in California.

Country life in California has many attractions. The weather is pleasant most of the time and so mild that one can sleep out of doors throughout the whole year. Each of these three regions, the sea-shore, the park-like valleys, and the mountains, has its own charms.

California is spending a large amount of money building state highways leading through the principal valleys with a branch to each county seat. Rural delivery of mail and the telephone, together with good schools, draw people to the country.

The scenery and climate attract thousands of visitors yearly.

The renown of our mild and healthful climate has gone everywhere. The climate and the wonderful mountain scenery attract people from all over the world. There is no scenery finer than that of the great volcanoes or the gorges of the Sierra Nevada Mountains. The Yosemite Valley is the best known of these attractions.

California is well situated for trade and commerce with all the world.

We see from the map that California occupies about one-half of the whole Pacific Coast of our country. The Great Bay of San Francisco lies a little south of the middle of this coast line.

The Pinnacles, Monterey County, one of the smaller National Parks.

San Francisco Bay receives the drainage and is the natural commercial center of about half of the state. San Pedro and San Diego Harbors form other important shipping points. The overland railroads connect with ocean steamers, opening trade and travel routes across the continent to all parts of the world.

TOPIC IV.—California Has Such Wonderful Scenery that People Come from All Parts of Our Country to See It.

Introduction.

Nature is everywhere at work on the surface of the earth. The muddy rills on the hillside or by the road during a heavy rain teach us this fact. The rills carry away so much earth and cut such deep gullies that sometimes the roads become impassable. It is easy to understand that if Nature has time enough she can in this manner tear down the loftiest mountains.

In some deserts the winds blow so fiercely over the surface that particles of dust and sand are picked up and carried to some distant region. In the north the ice which gathers on the slopes moves slowly downward, carrying away the loose earth and even grinding off the solid rocks. But it has taken more than water, wind and ice to make the grand scenery of California, although, as we shall learn later, these have all helped.

Nature is also at work **within** the earth, and, although in some parts of the earth she does not seem to have done much in a long time, yet in our California region she has never taken a rest.

She has built many of our lofty mountains by lifting up the solid earth. Whenever it breaks or slips a little we feel an **earthquake**, and we say that our mountains are growing.

Only a few of the earthquakes that have occurred since the Pacific Coast has been settled have done much injury, but little by little, through long ages, these earthquakes have made the highest mountains in our state.

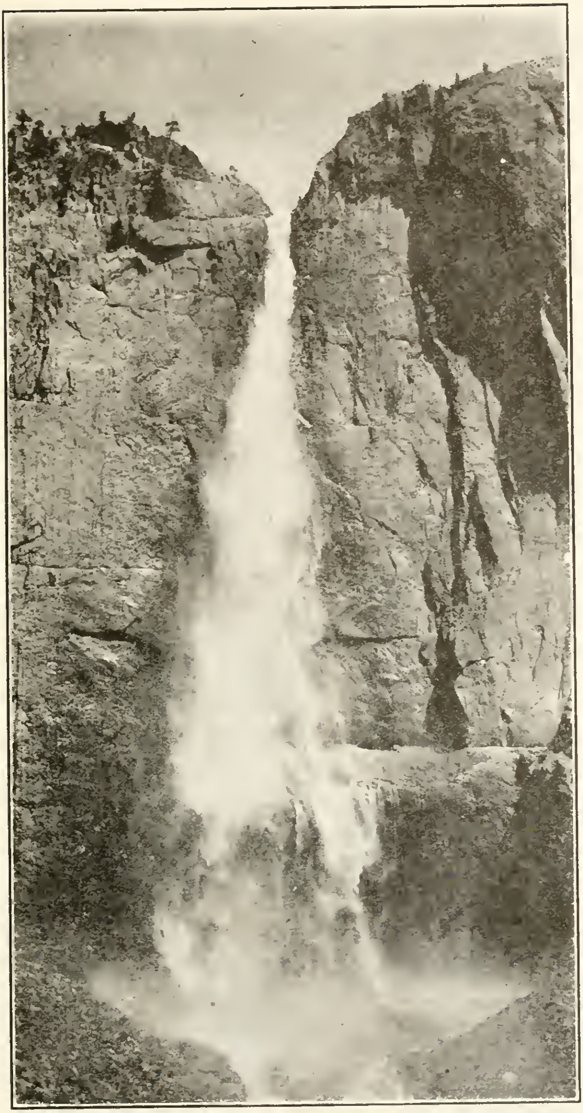
In addition to **earthquake mountains**, California has many **volcanic mountains** which add much to its attractive scenery. Northeastern California is one vast lava field and the eruptions of Lassen Peak tell us that Nature is still at work.

These are not the only ways in which our mountains have been made. Many great peaks stand out all alone because the rocks of which they are formed are hard and do not crumble easily like the rocks about them. These we sometimes call **erosion mountains.**

In what way does the great earthquake of 1906 help us to understand the story of our mountains?

The earthquake of 1906 was the most destructive one since California has been settled. One morning the earth suddenly broke and slipped along a fissure hundreds of miles in length, throwing down buildings and killing many people.

This fissure or crack in the earth began on the north beneath the ocean and where it appeared on the land near Point Arena it



Upper Yosemite Fall. This gauzy waterfall is more than 1000 feet high.

showed by the fences and roads that crossed it that the earth had slipped sixteen feet.

We can follow the line of the earthquake by the broken ground, the hollows, and ridges for 400 miles, to San Juan in San Benito County. From here a line of fissures made by older earthquakes leads us on through the Coast Ranges, along the southern side of the Mohave Desert, over the San Gabriel Range to the Valley of San Bernardino, and finally into the Colorado Desert, where we lose it. The total length of the great earthquake crack or fissure is more than 700 miles. It is the most remarkable thing of its kind in the whole world.

There are in places upon this fissure bluffs 200 to 300 feet high made by the rising of the land upon one side during some ancient earthquake. These bluffs are miniature mountain slopes and tell us very clearly how some of our great mountain ranges, such as the Sierra Nevada, were made.

What earthquakes have had to do with the making of our California scenery.

We must remember, in spite of the fact that earthquakes are really to be feared, for they sometimes do serious damage, that many of the things which make California such a rich and delightful land are due to them.

If there had been no earthquakes there would be few high mountains; there would be little picturesque scenery, the rainfall would be so small toward the south that there would be no water for irrigation and the country would forever remain poor and thinly settled.

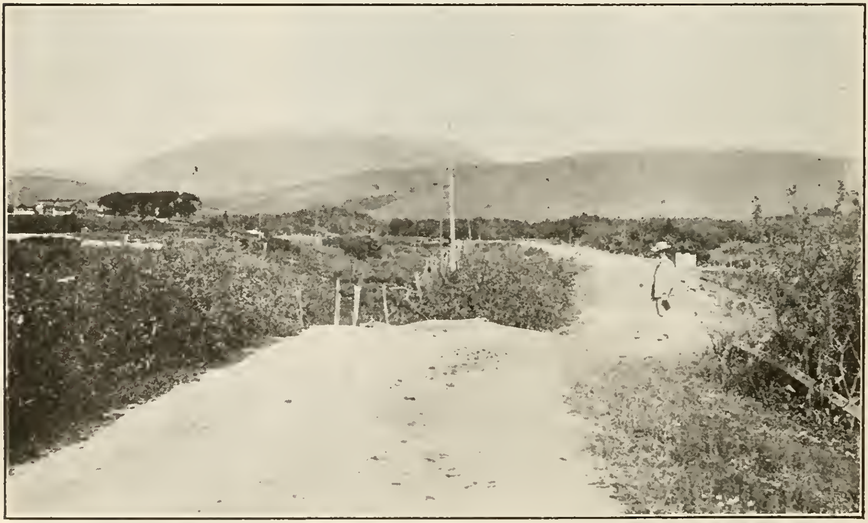
Even the golden riches of California, which first drew the pioneers, owe their presence in the rocks to fissures made by earthquakes which happened long ago.

The Sierra Nevada is our greatest range of earthquake mountains. It contains some of the finest scenery in all our country. It is covered with valuable forests and affords an abundance of water for irrigation. These mountains have been lifted along a fissure or crack until they now show a wonderful eastern wall more than two miles high. They are still growing, for in 1870 there occurred a severe earthquake in Owens Valley, where the earth slipped in places as much as fifty feet.

The San Gabriel and San Bernardino Mountains are also due to earthquakes. Their grand scenery adds greatly to the attractions of Southern California, and the water which they supply makes possible thousands of pleasant homes.

Great volcanoes add much to the scenery of California.

Mt. Shasta is a volcano and the grandest mountain in California, rising 14,380 feet above the ocean and standing all alone. It is white with snow most of the year and on the north side are large glaciers.



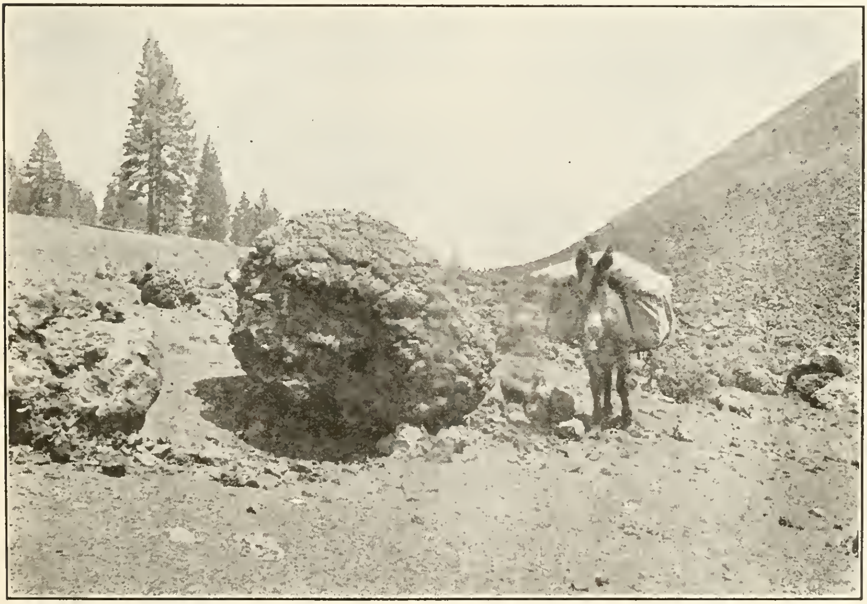
What the great earthquake of 1906 did to the road near Pt. Reyes. The road was broken and the parts shoved past each other twelve feet.

To understand how this mountain began and finally became so great, we will visit the Mt. Lassen region where Nature is starting anew her fires far beneath the surface. Here there are boiling springs, mud volcanoes, and a steaming lake, and not far away a cinder cone, lava flow, and ash almost as fresh as though formed yesterday.

Far beneath the surface it is very hot. In those regions where the myths say that Vulcan is at work, it often becomes so hot that the rocks are melted and some of this liquid material is squeezed out through cracks in the earth, forming **lava.** Sometimes water flows down through the cracks to where it is hot and so much steam is suddenly formed that a violent explosion takes place. These explosions throw out clouds of steam, ashes, red hot lava, and between the explosions there may be quiet flows of molten lava which spread over the surrounding country like a sheet. The ashes, cinders and coarse fragments gather round the crater and in time build up a **cinder cone.** This is the way Mt. Shasta started, but it did not always remain a cinder cone. Eruptions followed one another through thousands of years until the mighty mountain was at last built up.

How water and ice have helped make our scenery attractive.

Water is doing work all around us, as we can see every time it rains, for we can find its channels upon almost every hillside. Before water could begin this work it was first necessary, however,



Volcanic Bombs hurled out of Cinder Cone which rises on the right east of Mt. Lassen.

to raise lofty mountain peaks and ridges, for without their high and steep slopes water and ice could have done little.

As the mountains of California slowly grew into the great giants which they now are, the streams began to wash away the crumbling rocks and cut channels in them. Sharp, picturesque peaks appeared where the rocks were hard, and where they were soft valleys were formed.

In places the streams cut deep, narrow channels which finally became the mighty cañons which make our mountain scenery so celebrated. In this way arose the wonderful cañons of the Tuolumne, Merced, Kings and Kern Rivers. Among these the Yosemite, formed by the Merced River, is the most renowned.

Now, how could ice have had to do with the making of our scenery, since most of the state has such a mild climate? We would hardly expect ice to be of much importance where oranges hang in the open air all winter.

We must not forget that the climate of the lofty mountains is very cold, and, besides, more snow fell upon them long ago than falls now. In fact, there was so much snow that much of it did not melt, but became hard and solid like ice.

Streams of this ice moved slowly down from the high peaks and filled the cañons, but melted before reaching the warm lowland valleys. These streams of ice helped carve the mountains into picturesque shapes. They dug out many basins in which lie the beautiful lakes that reflect in their clear waters the granite cliffs above them. The lakes aid in holding back the water for summer use and their shores made pleasant camping places.

At the present time only a few glaciers remain and these are found on the shady slopes of the Sierra Nevadas, Cascade Range, and Klamath Mountains.

Nature has made many changes in California, and has not yet finished.

We have learned that the mountains are slowly being worn down. We have learned also that Nature is making new ones by means of earthquakes and volcanic eruptions.

We have found sea shells high on the hills and far from the ocean, and we wonder how they came there. Must it not be that what is now dry land was once beneath the sea?

Along the coast we find old beaches with pebbles on them hundreds of feet above the present sea. At Port Harford there are caves worn by the waves, but now many feet above their reach.

All the bays have been made by the sinking of the land and the flooding of river valleys by the sea. The Sacramento River once flowed through the rich valley now occupied by San Francisco Bay and emptied into the ocean outside the Farallone Islands.

Long ago the land sank so much that the valleys were flooded and the Coast Ranges changed into islands and peninsulas. At another time nearly all the islands along our coast formed a part of the mainland.

TOPIC V.—Some Thoughts on the Study of California Geography.

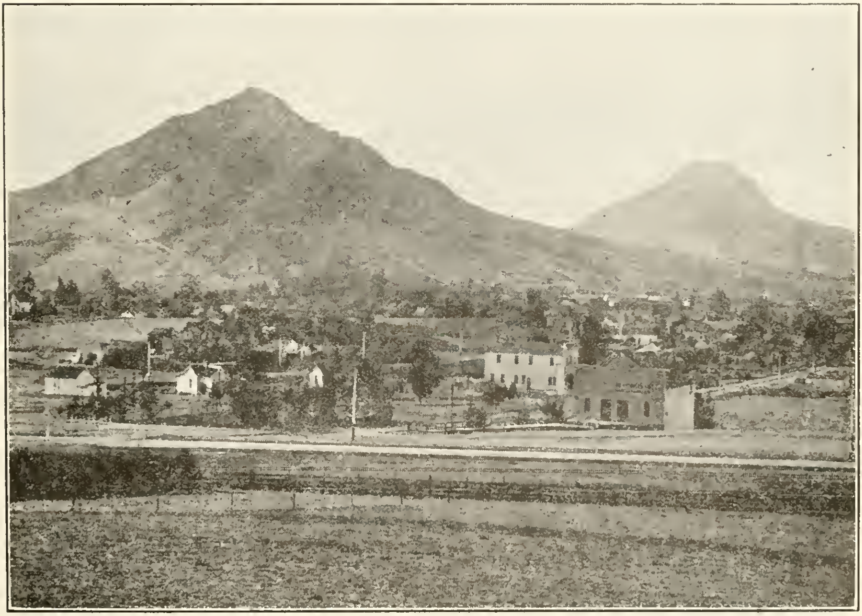
We have all kinds of climate, from the very cold to the very warm, and from the very wet to the very dry. We have mountains made by erosion of running water, earthquake mountains and volcanoes, plains, valleys and cañons with wonderful scenery. We have islands and bays and hundreds of beautiful lakes and waterfalls. We raise almost every sort of product except those which grow only in the tropics, and our situation is such that a large part of the commerce of the Pacific Ocean must come to us.

Why we should know our own State well.

It is important that we know our own state well, for the most of us will live here all our lives. For us this is the most important part of the whole world. We need to know our own state better than any other because this knowledge will be of advantage to us in every business we undertake. A good acquaintance with the region in which we live gives us a key with which we can unlock the geography of the whole world.

Why the geography of our State includes so much that we ought to know: A review.

1. **California is of great extent:** With the exception of Texas,



The wonderful Buttes near San Luis Obispo. Brothers to Morro Rock. Carved out by erosion of the softer rocks around them.

California is the largest state in the Union, containing, as it does, 156,092 square miles.

It is impossible for you to realize how large it is, and what a variety it contains, unless you travel across it from the deserts of the southeast over the snow-covered mountains and across the broad valleys to the dense forests of the northwest.

2. **California has many river basins, mountains, valleys, lakes, etc.:** The surface of California is not as simple as that of most of the other states, but is so broken and varied and has so many sorts of climate and productions that it might form a whole country independent of the rest of the world.

Mountain ranges divide the state into distinct portions, each with its own climate and productions.

Most of the streams flow into the Pacific Ocean, some sink in the deserts of the Great Basin, while one empties into the Gulf of California.

There are plains formed long ago beneath the ocean. There are great desert valleys which once held lakes; there are countless valleys formed by running water, and there is the Great Valley with its vast plain-like surface.

3. **California has many kinds of climate because of:**

A. Extent from north to south: California extends over ten degrees of latitude, which, if it were not for other causes of which we have learned, would make the north very much colder than the south.

B. Nearness to the Pacific Ocean: The temperature of the Japan drift changes but little from summer to winter. The winds which blow across it and the cold water near the shore and then over California make the climate of all the coast valleys milder and more even than it otherwise would be.

C. The position of the mountains: The mountains lie across the path of the westerly winds which blow from the Pacific Ocean. The seaward slopes of the Coast Ranges are cooler and more moist than the landward slopes.

The opening in these mountains at San Francisco Bay permits the sea winds to temper the heat of much of the Great Valley. The Los Angeles-San Bernardino Valley is open to the sea so that the cool fog-bearing winds reach far inland and cause the oranges to ripen later than in Northern California.

The Sierra Nevada, San Gabriel, San Bernardino and Peninsula Mountains are so high that they form a barrier to the moist westerly winds. Thus there is formed to the southeast of these mountains the driest and hottest deserts in the United States.

D. The height of the mountains: The mountains have still another most important effect upon our climate. While oranges grow at their bases, their summits are very cold. Between these two regions there is almost every sort of climate which one could wish.

E. More frequent storms toward the north: The mountains are not the only cause for the deserts in Eastern and Southeastern California. The storms are far more frequent toward the north. In

Oregon and Washington the storms are more frequent and the rainy season is longer than in California.

F. Summer thunder-storms partly make up for the lack of rain where the winter rains are light. These storms occur upon the deserts as well as the mountains of California, Nevada and Arizona. When the downpour is sudden and severe they are called **cloudbursts.** The floods often do great damage to roads and railroads.

4. **California has a wonderful variety of natural products:** Because of all the things which have just been mentioned, we can grow in California a remarkable variety of fruit, garden and farm products. Each district has a climate of its own, and the chief product of each is different from that of the others.

We can divide California into natural districts or provinces and thus make its geography more simple and easy to remember.

From what has already been said, we now see how much there is to learn about the geography of our state if we would understand it as we ought.

The relief map shows, if we examine it carefully, that we can divide California into a number of natural districts or provinces. Each district or province differs from the others in the sort of surface which it possesses and also in its climate and in its productions. If we take up the study of each province by itself, our task will be much easier.

The seven natural provinces of California.

1. **The Great Valley of California:** This is also known as the

The rugged eastern front of the Sierra Nevada Mountains from Owens Valley.

Great Central Valley, or the Sacramento-San Joaquin Valley. The relief map or model shows that this valley extends north and south for four hundred miles through the heart of California. The surface, climate and industries make this a natural region.

2. **The Coast Ranges:** These mountains lie between the Great Valley and the ocean. They include many ranges and thus form a mountain system. Between the different ranges are many beautiful and fertile valleys.

3. **The Sierra Nevada Mountains:** These mountains form the great barrier which the pioneers had to cross before they could reach the Land of Gold. They form a picturesque region of granite peaks, deep cañons and dense forests. Here rise the greater number of the important rivers of California.

4. **Southern California:** This region first made California famous for its oranges. It is known for its mild winter climate and attractive scenery.

5. **The Great Basin:** A region of mountains and deserts, alkaline lakes and strange animals and plants.

6. **The Klamath Mountains:** A picturesque region of forest-covered mountains and cañons, occupying the northwest corner of the state.

7. **The Volcanic Plateau:** An elevated region of ancient volcanoes, extensive plateau valleys and forests.

Bullfrog Lake at the head of Kings River, Sierra Nevada Mountains. This lake is due to a hollow in the rocks which was scraped out by an ancient glacier.

SUMMARY.

When California was discovered it was one of the fairest lands ever looked upon.

Owing to its position, extent, varied surface, and to the direction of the winds which blow over it, California has such a variety of climates that every one can find within its boundaries that which is most agreeable to him, and engage in the sort of farming that he likes best.

Nature's gifts are, however, unevenly distributed, which fact caused the settlement of the more favored portions long in advance of the less favored. People rushed to the gold regions first. Then they spread to the fertile valleys which had an abundance of rain, and when they had learned the advantages of irrigation settled the drier parts of the state.

Manufacturing is becoming an important industry as a result of the discovery of vast deposits of oil, but agriculture will always remain as the foundation of the wealth of California.

The natural resources of our state, so rich when people first came, will disappear as they have in other countries if we do not use them carefully.

We must see that the soil is not washed away from our fields and that the mountain slopes remain protected by the forests so that the water supply is not lessened.

The forests form one of our most important resources, and if the trees are not cut or burned faster than they grow, these forests will always remain to furnish lumber and fuel and enrich us in many other ways.

The wild creatures should not be wantonly destroyed, for many of them are very useful. The birds in particular are among our very best friends.

Because of the mountainous surface and few navigable streams, travel through California was difficult in the early days.

After the gold excitement the population did not again increase rapidly until the railroads were built connecting with the East and the value of irrigation had become known.

The careless farming of large ranches is giving place to the careful cultivation of small ones.

REVIEW QUESTIONS.

Mention the important natural resources of California.
Describe any of the wild animals of California that you have seen.
Describe any of the forests that you have visited.
What is needed to make trees grow to a great size?
Mention some of the reasons why California has a great variety of plant and animal life.
What parts of the state were first settled? Why?
Why does the farmer usually take more pains with his home than the miner?

Mention some of the minerals found in California, beginning with the most important.

In what way does the story of oil or petroleum differ from that of coal?

In what way have we been careless of our natural resources?

Why do we need water so much in the summer?

What is the result of the washing away of the soil by the rains?

How does Nature protect the soil?

Why should we be careful not to injure the mountain slopes about the heads of the streams?

How do the forests aid in holding water for use in summer?

Mention all of the uses of the forests that you can think of.

Tell what you can about the condition of those people who have cut down their forests.

Give all the reasons you can for preserving the birds.

Which of our resources will never be replaced by Nature when we have used them up?

Why was there little land cultivated in the old Spanish days?

Describe any pass that you have seen between the hills or mountains, and tell if it is made use of.

Mention the important passes leading into California.

How could the coastal slope of California have been settled if no passes had been found?

What is usually the easiest means of travel in exploring a new country?

What were the chief products raised in California before the building of the railroads?

What are now the chief products?

By what routes are these products now shipped to Eastern and foreign markets?

What means have we now of preserving perishable products until they reach market?

Tell something about the advantages of irrigation.

In what parts of California is irrigation most necessary? Why?

Tell what you can about the Los Angeles aqueduct.

What are the advantages of country life in California?

Tell what you can about the earthquake of 1906.

How does this earthquake help us to understand the making of our great mountains?

Tell what you have read about the eruptions of Mt. Lassen.

Mention some of the great volcanic peaks in California.

Tell what you can about the beginning of a cañon, basing your description on what you have seen during a heavy rain.

Why are the glaciers in the mountains of California few and small at the present time?

Why should we know the geography of our home and state better than that of other countries?

Why is the geography of California so difficult? Give all the reasons that you can think of.

In what way can we make its study more simple?

PRACTICAL LESSONS.

For the growth of great coniferous forests there is needed a moist air and mild temperature like that of the middle slopes of our California mountains.

A mountainous country has a much more varied climate than a level country.

A country over which ocean winds blow has a more mild and even climate than one whose winds come from the lands.

A new country is ordinarily settled first along the waterways.

People will go to any sort of country, even though it be a desert or have an arctic climate, for the sake of gold.

Manufacturing will not become important in any place unless it has water power or cheap fuel.

A country whose resources are used up faster than Nature increases them will in time become poor.

The farmer who takes no care of his soil will never be prosperous.

The inhabitants of a country whose forests have been destroyed have a hard time to make a living.

Our national parks and forest playgrounds are worth far more to us left as Nature made them than if the forests were cut down and the land cultivated.

We should study carefully the habits of the wild creatures and protect all that are not harmful.

Mountain passes make possible the settlement of a country which without them would long remain uninhabited.

Before we raise a crop we should first be sure of a market.

Crops are much more certain when irrigation is used than when we depend upon chance showers.

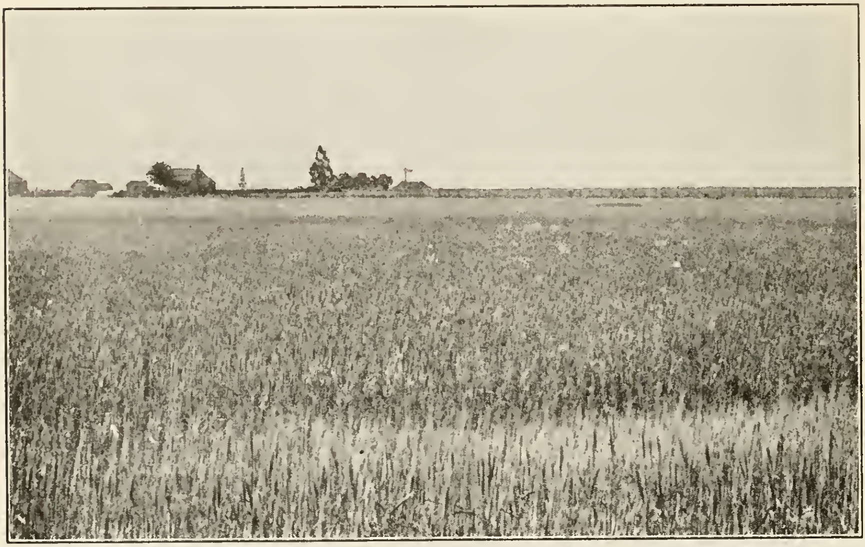
An irrigation canal.

Earthquakes are often blessings in disguise.

Nature is ever changing the surface of the earth, but in mountainous regions is working much faster than upon gentle lowland slopes.

People can now control Nature's way of doing things and overcome the obstacles she has put in the way far easier than they could long ago.

If we do not first know the country we live in, we have no means of knowing other countries.



The Sacramento Valley, level as a floor, supports vast fields of wheat.

CHAPTER IV.

The Great Valley—The Granary and Future Garden of California.

Where lies the valley of which we are going to learn, and why is it so named?

In the heart of California is a lowland region of such vast extent that all the other valleys might be spread out in it and then not cover it. The valley is entirely inclosed by two great lines of mountains, the Sierra Nevadas on the east and the Coast Ranges on the west. If we should draw a line along the summits of these mountains, the space thus included would equal about half the area of the state.

This lowland is fully 400 miles long from north to south and in places fifty miles wide, and much of the surface is almost as even as a floor. We might call it a plain, as has sometimes been done, but it is a true valley, being surrounded on all sides by mountains. Because of its size it has become known as the Great Valley of California.

By what names are parts of the Great Valley commonly known?

The Great Valley is really formed of two valleys placed end to end. The northern one is called the Sacramento Valley, the southern one the San Joaquin. The valleys slope toward each other and in traveling through them we cannot tell when we leave the one and enter the other.

The river which drains the northern valley is known as the Sacramento. The main river of the southern valley is the San Joaquin. These rivers come together in the form of the letter "Y" in a delta region of marshes, and then enter Suisun Bay. Continuing westward the waters of the united rivers break through the Coast Ranges at the strait of Carquinez and enter the ocean through San Pablo and San Francisco Bays.

How is it that the Sacramento, though much the smaller of the two arms of the Great Valley, is drained by the larger river?

The Sacramento Valley extends toward the north, so that it and the surrounding mountains have a greater rainfall than the San Joaquin Valley, which extends toward the south. In truth, so little rain falls in the southwestern part of the San Joaquin Valley that this region is almost a desert.

If we follow the Sacramento River and its main branches, the Pitt, Feather and American Rivers, to their sources, we shall find that all flow through regions of heavy rainfall and all but the last rise outside of the rim of encircling mountains. They carry a large amount of water throughout most of the year.

The rivers of the San Joaquin Valley also rise in lofty mountains, but they do not all unite in the San Joaquin River. Its chief tributaries are the Merced, Tuolumne, Stanislaus and Mokolumne Rivers, which enter the northern part of the valley.

What becomes of the Kings, Kern and Kaweah Rivers, which carry great floods of water into the valley in the spring, but whose waters rarely enter the San Joaquin River?

If we could follow the Kings River downward from the point where it leaves the mountains, we would see that it spreads out over a large extent of country in many branching channels, forming a true delta. On this delta are situated the luxuriant gardens, orchards and vineyards of the Fresno region.

The river has through many, many years been bringing soil and sand from the mountains and has at last built up its delta so that it now forms a low ridge entirely across the valley. This ridge or water parting turns the waters of the Kings as well as of the Kaweah and Kern Rivers southward away from the San Joaquin.

The waters of the Kings River thus gather in a basin and form Tulare Lake, which was in early days one of the largest bodies of water in the state. Farther south the water of the Kern River collects in another basin, forming Buena Vista and Kern Lakes.

So much of the water of Kings River is now used for irrigation that Tulare Lake has nearly disappeared. After a time, as more settlers come to this region, the water will all be used for irrigation and the once great lake will appear no more upon our maps.

Who were the first settlers in the Great Valley?

The Spaniards never spread into the Great Valley, for they were comparatively few in number and the region lay far from the coast.

The first white man to make his home here was Capt. Sutter, a Swiss, who came in 1839. He obtained a large grant of land and built his celebrated fort near the mouth of the American River.

When gold was discovered and people from the East began to pour across the Sierra Nevada Mountains, they found at Sutter's Fort a chance to rest and renew their supplies and obtain directions for reaching the newly discovered mines.

The town of Sacramento soon sprang up on the Sacramento River near the fort and became the terminus of all the emigrant trails across the Sierras.

To Sacramento came, also, many of those who landed in San Francisco, for this was a central point easily reached by water. From there the Great Valley, stretching north and south as far as the eye could reach, formed an open highway to the foothills where the gravels were waiting to give up their golden treasures.

Among the most noted of the early emigrants who settled in the Sacramento Valley was General Bidwell, whose ranch and orchards were widely known.

Why do we call this valley the granary and future garden of California?

Do you not think that the word **granary** is a suitable name for a valley in which you can travel for days through fields of waving grain? For many years the Great Valley has been one almost continuous field of wheat, barley and oats. California has been known as one of the great grain producing states. We have shipped wheat and flour to all parts of the world. The most of this was grown in the valley of which we are speaking.

The Great Valley was first given over largely to the raising of cattle, horses and sheep. Then it became the granary of the state, and although large quantities of grain are still raised, it is slowly being transformed into a garden. The great ranches which were usually poorly cultivated and whose owners had few of the comforts of life are being cut up into small ones, which under careful cultivation produce everything that can be desired.

To make a garden three things are needed: rich soil, water and a suitable climate. The most of the valley has a rich soil. An abundance of water for irrigation is supplied by the many rivers which flow from the Sierra Nevada Mountains. To those parts not supplied by Nature we carry water by means of many canals. The climate is adapted to the growing of a great variety of products. When enough people have come to make use of all these gifts, the Great Valley will become the garden of California.

Is the situation of the valley favorable to its becoming the home of a great farming people?

In order that the Great Valley may become thickly settled, there must be a market for what is grown there. If we look at the map we shall see how Nature has arranged the outlets of the valley.

Stockton water front.

The streams and slopes all lead toward the point where the two main rivers unite and flow down through the Coast Ranges to the city of San Francisco. This city is one of the markets of the valley, and it has the farther advantage of being connected with all the world by water.

Four railroads lead out of the state through mountain passes. One extends north, two east and one southeast, connecting the valley with other parts of our country whose people are looking for the many things grown here which they cannot grow.

Has the situation of the Great Valley any disadvantages?

Our relief map tells us that there is a rim of mountains all about the valley, and that these mountains are in most places high and difficult to cross. The gold seekers found them the worst obstacles in all their long journey across the continent.

There are few roads over the Sierra Nevada Mountains, and these are passable only a part of the year because of the snow. Beyond the mountains are deserts which also help to separate the people of the Great Valley from other valleys.

Only one wagon road has been built across the higher part of the Coast Ranges north of San Francisco, and that extends from Redding to Eureka. South of San Francisco there are several passes leading through the Coast Ranges, but there is little travel over them because the country bordering upon the San Joaquin Valley is very dry and thinly settled.

What makes the climate of the valley so warm?

We have already learned that the Great Valley is separated from the ocean by a mountain system which we call the Coast Ranges. If we should leave the coast on a summer day, when the cool winds from the sea are burying all the adjacent valleys in fog, and should cross the mountains to the Great Valley, we would find the sun shining brightly and the air hot and dry. In spite of the heat we would not suffer because the air is so dry.

At the Strait of Carquinez, where there is a gap in the mountains, there is such a strong draught of cool air into the valley that a little sea fog sometimes creeps in, cooling all the delta region as far as Sacramento and Stockton. The summer heat is not unhealthful and sunstrokes are rare. Without the heat and the many months of bright, sunny weather, we would not find there such sweet oranges and raisins.

The Coast Ranges make the Great Valley so much warmer than it would be if open to the sea winds that oranges as far north as Oroville ripen much earlier than they do in the San Bernardino Valley, which is 400 miles farther south.

The earliest spring fruits, such as cherries and apricots, do not come from the south, as we might expect, but are produced in the region about Vacaville on the western side of the Sacramento Valley close under the protecting shelter of the Coast Ranges.

A Typical Scene in the Great Valley of California

Another interesting thing about the Great Valley is that it has fogs in winter when there is little fog on the coast. The winter fog is called **tule fog,** because it is heaviest in the low delta region, where the tules grow. It is caused by the moisture from the ground rising into the cold winter air.

How is it that parts of the Great Valley are so thinly settled?

The western side of the San Joaquin Valley is very dry and toward the southern end it is like a desert. No streams flow down from the Coast Ranges, and as there is neither enough rain nor water for irrigation, this region is almost uninhabited by farmers.

We are learning from our study of California how mountains by furnishing a supply of water make it possible for people to settle and have comfortable homes in many of the valleys where little rain falls. We must remember, however, that most of the storms come from the west, striking most severely on the slopes of the mountains which face the ocean. On the opposite or eastern side of the mountains there is less rain than if there were no mountains at all.

This is why the western side of the Sacramento and San Joaquin Valleys, close to the Coast Ranges, is so dry. These mountains not only cut off the cool winds, making the valley hot in summer, but they also break the force of the storms.

The cool air of the slopes toward the ocean causes heavy rain to fall as the storms pass over them. By the time the clouds have reached the Great Valley they have lost so much water that in the

Picking cantaloupes in the San Joaquin Valley.

warmer air of this region the rain may cease to fall and the sun shine out.

As the air moves still farther eastward it reaches the high Sierras. Here it becomes chilled again. The clouds grow thick and heavy and finally afford rain or snow.

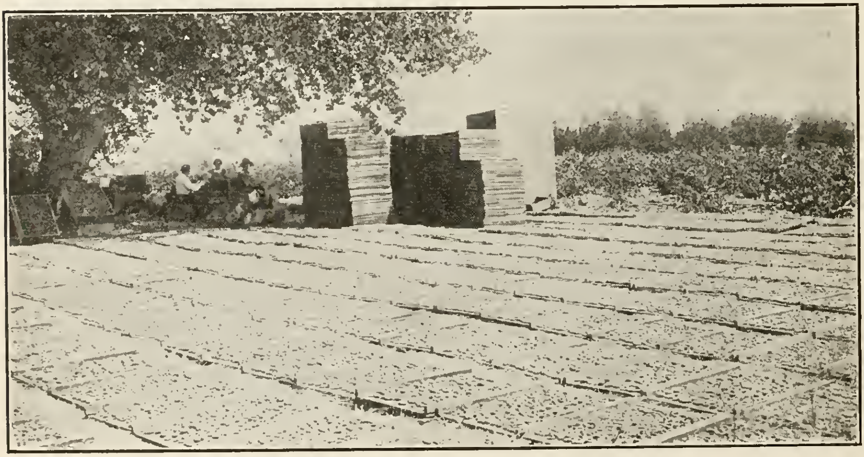
In this way the mountain streams are fed that supply water to the farmers to irrigate their fields in the valleys where, perhaps, no rain has fallen.

The reason why the San Joaquin climate is drier than that of the Sacramento is that many storms pass across the northern part of our state without reaching the southern valleys. There may be days of rainy weather in the Sacramento Valley, while in the San Joaquin there are only clouds in the sky.

How is it that the Great Valley, although it has such a dry climate, is so well supplied with water that it will some day support millions of people?

If you should journey up the west side of the San Joaquin Valley in summer you would not come to a single stream of running water. Upon the west side of the Sacramento Valley you would find a few small ones. If you should now take a similar journey along the east side of the Great Valley you would find many rivers which in the spring and early summer are so large that you would have difficulty in crossing them. They pour such a flood of water into the valley that the lowlands are sometimes flooded and travel is interfered with.

All these rivers take their rise in the snow banks, springs and lakes of the mighty mountains lying to the east and north. They furnish water enough to irrigate not only the whole of the eastern side of the valley, but the western side as well. The building of reservoirs and canals will enable us to hold the flood waters and



Drying apricots in San Joaquin Valley.

distribute them to thousands of square miles of the richest soil which Nature left dry and barren.

How is it that the Sierra Nevada Mountains, though they make communication with the East so difficult, are nevertheless of the greatest importance to the people who dwell in the Great Valley?

1. **The mountains are useful because they supply water for irrigation:** Without the Sierra Nevadas the rivers of the Great Valley would be few and small. The southern part of the valley would be so dry that it would be useful only as pasture for cattle and sheep. Farther north the heavier rains would make possible the growing of grain. Without water the population must have remained small and scattering.

The Sierra Nevada mountains have so great an extent and are so lofty and cold that the clouds which passed over the Coast Ranges without losing their water particles are here compelled to give up nearly all that they have in the form of heavy rains and snows.

2. **The mountain streams furnish water power:** The people of the Great Valley need electricity for lighting their homes. It is needed for running cars and for manufacturing. The mountain streams flow swiftly down through their cañons and furnish un-

A flooded rice field in the Sacramento Valley.

limited power, when turned into electricity, for doing all kinds of work.

3. **The mountains furnish fire-wood and lumber:** The mountain slopes are covered with forests because of the heavy rains and snows. These forests contain a great variety of trees suitable for fire-wood and lumber. The wood is usually brought to the valley in wagons. The lumber is sawed in the mountains and floated down to the valley in flumes.

4. **The mountains furnish summer camp grounds:** In the summer the people of the Great Valley delight to make excursions into the mountains, where the cool, shady slopes, pure water and grand scenery make living out of doors pleasant and healthful.

What was the appearance of the Great Valley when people first came?

Fremont, the first explorer, speaks of the country about Sutter's Fort as surpassingly beautiful with rich grasses, flowers and groves of oak trees. There were deer, antelope and elk in the open and bear in the thickets along the streams.

Majestic oak trees give parts of the Sacramento Valley the appearance of a park. As we go south there is less rain, the trees disappear except for those on the bottom lands along the streams. Far to the south on the deltas of the Kings, Kern and Kaweah Rivers are scattered cottonwood trees.

It was in the spring that the valley appeared so beautiful to the emigrants. Flowers of many colors made brilliant the open plains as far as the eye could reach. Most prominent among them was the orange-colored poppy, now the state flower.

A group of ancient volcanoes.

How there came to be volcanoes in the Sacramento Valley we cannot tell. A few miles northwest of Marysville, in the middle of the valley, rise the sharp points of the Marysville Buttes. Long ago these buttes threw out ashes and lava, but now they are quiet and are slowly crumbling away.

Why are the rivers of the Great Valley so little used by boats?

The Sacramento River forms an important highway as far as the city of Sacramento. The San Joaquin River is of equal importance for the transportation of freight and passengers as far as the city of Stockton.

Before the building of the railroads, these rivers offered the only easy means of reaching the interior of the state. Boats once went up the Sacramento as far as Red Bluff and the Feather River to Marysville, but hydraulic mining has so filled the channels that these portions are now too shallow for boats of any size except during spring floods. When the valley becomes more thickly settled the rivers will be dredged so that freight boats will go as far north as Redding.

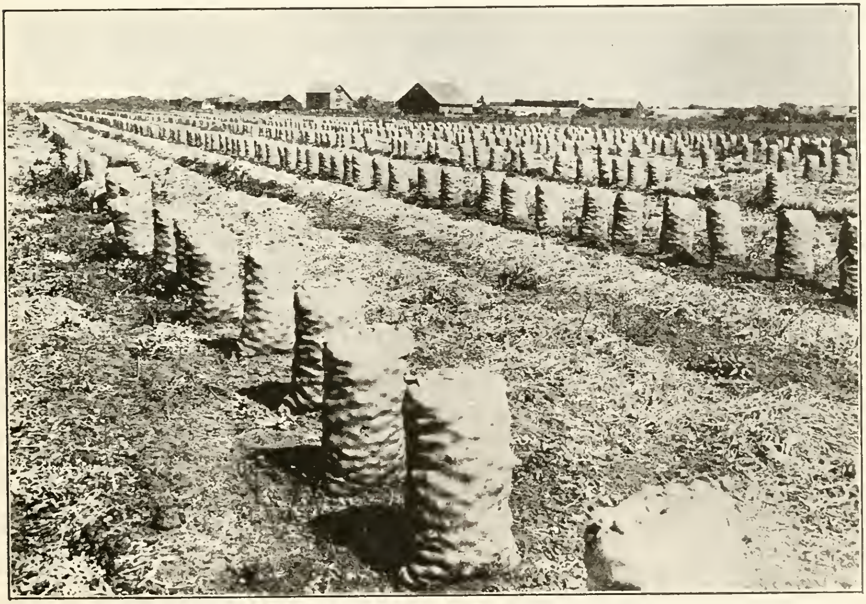
Some time the San Joaquin River and its tributaries will be deepened and we shall probably see a long canal dug southward through the whole length of the valley to Buena Vista Lake. When that time comes, the lands which are now unfruitful because of the lack of water will be thickly settled. The farmers along the canal will have a cheap and easy means of sending their produce to market, and the vast oil fields of this region will be able to get their supplies with much less difficulty.

How is it that the "Delta Region" has such rich soil?

As we cross the Great Valley on our way from San Francisco to Sacramento or Stockton, we ride over miles of marsh lands covered with waving tules. If we happen to cross this region in the spring, we find that a vast lake has covered the tules, for the streams bring so much water during their floods that it cannot at once escape through the Strait of Carquinez to San Francisco Bay.

Long ago there were no marshes here nor any delta, for the land stood higher than now and the San Joaquin-Sacramento River emptied into the ocean outside of the Golden Gate. Finally the land began to sink and soon the ocean water swept in and flooded the lower valleys of the river, making San Francisco, San Pablo and Suisun Bays.

Suisun Bay became a great body of water, reaching probably as far as Sacramento and Stockton. Into this bay the rivers of the Great Valley emptied. Year by year they brought down the richest particles of soil, as the rains washed them from all the mountain



The result of the farmer's toil on the rich delta lands of the Sacramento-San Joaquin rivers.

slopes about the valley. This fine, muddy material slowly filled the bay until the most of it was turned into the marsh of today. Some time Suisun Bay will be entirely filled.

Beneath the tules of the marshes the soil is deep and dark and rich. Dikes of earth are now being built to protect from the floods, and powerful machinery is used to pump out the water as fast as the dikes are completed.

Many thousands of acres have already been reclaimed and produce luxuriant crops. The fertility of the soil tells us why in other parts of the world deltas have been inhabited by such rich and prosperous peoples.

How irrigation will make homes for millions of people.

We have seen how water is the life of the land; without it there can be neither plants nor animals nor people. The lack of water in many parts of the earth leaves them uninhabited, or if people do manage to live in them they have to move from place to place to obtain feed for their cattle. They build no permanent homes nor do they have many comforts.

Few settlers occupied the drier parts of the Great Valley before the introduction of irrigation. Their ranches were large and the towns were far apart. This was the time when cattle and grain were the chief products. It took thousands of acres of this dry land to support one family.

Now great reservoirs have been built in the mountains to hold the water for summer use, and many canals lead this water to the thirsty land. Green fields of alfalfa, orchards and vineyards are spreading over the valley and comfortable homes are springing up.

Why do we call this valley the "Garden of California"?

The Great Valley contains the largest area of rich land in California. It has also a climate which will grow almost everything that can be desired, and finally it has an abundance of water for irrigation.

Much of the area of the valley is yet uncultivated, much is still devoted to grain, but wherever water has been carried orchards and vineyards and thickly clustered homes with every comfort are turning it into a garden.

The successful growing of alfalfa has led to the development of dairying and hog raising until they have become important industries.

Oranges, lemons, figs and olives are grown everywhere, but the two first do best about the borders of the valley, where the land rises to meet the foothills, for here it is less frosty.

The growing of table grapes is an important industry. The climate and soil of the Fresno district have been found especially suited to the raisin grape and so this has become the center of the raisin industry of the state.

Peaches, apricots and pears are raised in great quantities. These together with cherries reach the market first from the Vacaville region.

The "delta" about which we have just learned is remarkable for the variety and richness of its productions. If we take the steamer down the river from Sacramento in the summer, we see the boat taking on fruit and melons at every landing. If we go up the San Joaquin River to Stockton, we see men taking care of great fields of potatoes, celery, asparagus and onions.

The growing of rice along the lowlands has become one of the most important industries of the Sacramento Valley. If it were not for the absence of the curious costumes of the people of the East we might almost imagine, when we look at these great fields of rice, that we were in Japan, China or Java. Cotton growing is being tried in the San Joaquin Valley, where the great heat and long growing season offer favorable conditions.

How do the people of the valley dispose of the vast quantities of fruit which they raise?

Thousands of carloads of fresh fruit and vegetables are sent to the Eastern market from Sacramento, which has become the central shipping point. The use of refrigerator cars enables these products to reach the East in a fresh condition.

Many canneries use up a large part of the fresh fruit, while immense quantities are dried. Dried fruits will keep a long time and can be sent to any part of the world.

Does the Great Valley supply any minerals?

We do not look for minerals in a valley because they are usually found in rocks. In the valleys the rocks are buried deeply by the soil, but they appear everywhere in the hills and mountains which inclose the valleys.

In the hills about the borders of the southern San Joaquin Valley, and in some places extending into the valley, are some of the most wonderful petroleum deposits known in all the world.

Nature seems to have placed the oil fields in the driest and most desert-like portion of the valley, as though she wished to have all the land useful for something.

The most important fields are the Kern, near Bakersfield; the Sunset, Midway and McKittrick, on the west side of the valley opposite Bakersfield, and the Coalinga field, on the opposite side of the valley from Fresno.

The oil is obtained by drilling wells in the earth, some of them being nearly a mile deep. The oil is dark and some of it is quite thick before it is refined. The dark oil is valuable as fuel for engines of all kinds. It has largely taken the place of wood and coal upon the railroads of the West and upon the boats plying the Pacific Ocean.

There are many wonderful wells in the Sunset district. Two wells spouted oil high in the air for many months, and produced as much as 50,000 barrels of oil each per day.

Immense quantities of gas, suitable for lighting and for running engines, comes out with the oil. Much of this gas was at first wasted, but now it is piped to Los Angeles, where it is used for many purposes.

An important mining industry in the Sacramento Valley is dredging for gold in the beds of the rivers. The center of this mining is the Feather River bottom lands near Oroville.

Thousands of acres of rich lands have been turned upside down and ruined in the search for gold. The cultivation of oranges and olives, which are now produced in large quantities about Oroville, is, however, a far more permanent source of wealth than this sort of mining, which has destroyed so much fertile land.

The towns that grew up in the Great Valley in the pioneer days.

In the early days all the supplies for the mines had to be brought from San Francisco, for, before the railroads were built, it was impossible to transport them across the continent.

Freighting on the rivers of the Great Valley became an important business, for they were deeper and easier to navigate than they are now. The loads were discharged at points nearest the different mining camps and at a number of these points important towns

A busy river scene at Sacramento.

grew up. The supplies were carried to the mines from the landing places upon huge freight wagons drawn by long strings of mules.

Just below Sutter's Fort a town sprang up which has since become an important city and capital of the state. Sutter's Fort first attracted people to this point because it was in the foothills nearby that gold was first discovered.

The new town of Sacramento was found to be centrally located and so all the overland emigrants came here first before scattering to the different mining camps.

The situation of Sacramento was, then, favorable for it to grow into an important city. Large boats came up the river as far as this point. From here the first railroad was built to Folsom, a mining town in the foothills. The most important overland trails terminated here, and here came also the Central Pacific, the first overland railroad.

With the building of the railroads through the Sacramento and San Joaquin Valleys, Sacramento became more important still as a distributing point. It is now the center of a rich fruit-growing district and the point from which thousands of carloads of produce are sent East.

Marysville sprang up at the head of navigation on Feather River. It soon became an important place, for there were many rich mines that were easiest reached from here. After a few years

The beautiful grounds of the state capitol at Sacramento.

the hydraulic mines washed so much sand and gravel into Feather River that its channel was filled up. During the spring floods it overflowed and covered hundreds of acres of rich bottom lands with barren sand. Marysville would have been flooded also if strong dikes of earth had not been thrown up. Now the bed of the river is higher than the streets of the town.

At a point near the limit of navigation on the Sacramento a reddish colored bluff overhung the river and so the town which grew up here came to be known as Red Bluff. All the northern mines in Shasta, Trinity and Siskiyou Counties were reached from Red Bluff.

When the railroad was built to Redding, it in turn became the distributing point for the north. Boats cannot now go to Red Bluff, but some time the river will be dredged and freighting on the upper Sacramento will again become important.

It was a long land journey from Sacramento to the southern mines and so an easier route was sought. This led to the establishment of a town on a branch of the San Joaquin River, where now is the city of **Stockton.**

The present city owes its importance partly to the fact that it is in the center of a rich and highly cultivated region and partly to its being at the outlet of the great San Joaquin Valley. To this point produce can be brought from all parts of the valley by railroad and then transferred to boats. Important flour and other mills are located here.

The settlement of the valley has led to the growth of new cities and towns.

Fresno is the most important of the newer cities and is destined to become the metropolis of the San Joaquin Valley. It looks as if Nature intended that there should be a city here in the center of the great fertile delta of the Kings River.

This delta is not marshy like that of which we have recently learned. It is, instead, a vast, gently sloping plain built up by the sand, gravel and soil brought down by the Kings River. The river splits up into many branches on the delta and these have been farther increased by the building of canals so that the whole is thoroughly watered.

Orchards and vineyards extend out many miles in every direction from the city of Fresno. The growing of the raisin grape has become such an important industry here that Fresno has become known as the raisin center of California.

Bakersfield is situated in the southern end of the valley on the Kern River. Although the city is surrounded by many miles of the richest lands, these are as yet but thinly settled. When the name Bakersfield is mentioned, we think of the oil fields and their many miles of derricks where the oil is being pumped out of the earth. The city is the center for the most important oil districts in the state.

Taft and **Coalinga** on the west side of the San Joaquin Valley have become important towns in a dry and desert-like region where there is neither a farmhouse nor any cultivated land to be seen. They depend solely on the oil business, and if the wells should cease to produce, every one would leave.

Tulare and **Visalia** owe their situation to the delta of the Kaweah River. To the east of these places in the edge of the foothills are the most important orange growing districts of the San Joaquin Valley.

View of Fresno from an aeroplane.

There are many other towns in the Great Valley, such as Merced, Modesto and Chico, each of which forms a center for orchards and green fields of alfalfa, but there are still hundreds of thousands of acres of uncultivated land upon which the wild flowers bloom a they did when the state was first explored.

SUMMARY.

The Great Valley includes a vast area of almost level land in the heart of California. It is surrounded on all sides by mountains which makes access difficult except by the single outlet to San Francisco Bay.

The climate is hot in summer and in the southern part ver dry. Although possessing a soil deep and rich and abundantly supplied with water by the rivers that come down from the Sierra Nevada Mountains, the valley remained poorly cultivated for many years.

It was not until the railroads were built and the value of irrigation understood that many people began to settle here. Then the great ranches which had been devoted to stock and grain began to be cut up into small ones; orchards began to be set out and new towns to spring up here and there.

While the valley has been known as the "granary" of California," it is fast becoming a garden in which millions of people will some time find comfortable and happy homes.

REVIEW QUESTIONS.

Tell what you can about the mountains that surround the Great Valley, and trace its watershed on the map.
Through what gap is the valley easily reached?
Describe the formation of the deltas of the valley. Which is the most important one and what are its productions?
What do the mountains afford the people of the valley that they could not do without?
At what point was the first settlement made? What city afterward sprang up here?
Why are the rivers navigable for so short a distance?
Explain from the map where a canal could be easily dug through the San Joaquin Valley.
Why is the western side of the valley less thickly settled than the eastern?
How is it that so little rain falls in the southern part?
How would the climate be affected if the Coast Ranges were taken away? What effect would this have upon the industries?
Why were the large ranches necessary before the coming of irrigation?
Mention the most important fruits and tell how they are marketed.
What sort of a climate is needed for making good raisins?
Describe the methods employed in the growing of rice. Can rice be grown where there is little water?
For what different purposes do the people of the valley use the mountain streams?
How would the deepening of the rivers and the building of canals help the Great Valley?
What mining industries are carried on here?
Give reasons for the situation of Sacramento, Stockton, Redding, Fresno.

PRACTICAL LESSONS.

A valley surrounded by mountains is difficult to reach, but these mountains may at the same time be of such value that it would not be habitable without them.

Mountains afford attractions and resources of many kinds which add greatly to the wealth of the neighboring valleys.

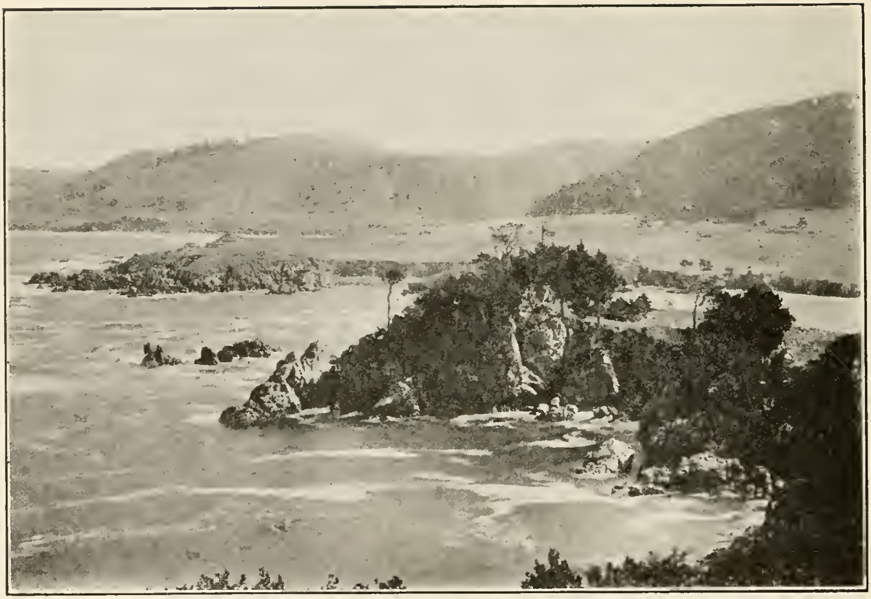
A region which is cut off from the ocean winds by mountains is hotter in summer and colder in winter than it otherwise would be. It has ordinarily also less rainfall.

The careful cultivation of a small piece of land is more profitable than the careless cultivation of a large piece.

Cities and towns spring up at those points where Nature has made it convenient for men to meet for various purposes.

A land which has rivers and canals for carrying goods has an advantage over one dependent upon wagon roads and railroads.

Wherever water can be obtained for irrigation, a dry and desert country can be turned into the most productive of gardens.



The rocky shore of Carmelo Bay—back of which rise the rugged Coast Ranges.

CHAPTER V.

The Coast Ranges: A Region of Mountains and Innumerable Park-Like Valleys Whose Fertile Soil and Agreeable Climate Make This An Attractive Land.

Introduction.

The name "Coast Ranges" tells us at once in what part of California the mountain region which we are going to study is situated. We must remember, however, that the mountains which we call the Coast Ranges do not include all those near the coast, but only such as are situated between the Great Valley and the ocean.

Both to the north and south of those mountains which we agree to call the Coast Ranges are others bordering the ocean but which have different names.

The relief map shows us that the Coast Ranges are not, like the Sierra Nevadas, formed of one great and lofty range, but of many ranges of much less height. We call the Coast Ranges a **mountain system** because they consist of a number of ranges grouped together.

We learn farther from the relief map that these ranges extend parallel with each other and nearly parallel with the general line of the coast. They lap past each other like the shingles on a roof. Where a range ends there is a headland or cape, and where there is an opening through a range or between two ranges there is a bay. Most of the bays are, however, not well protected because of the direction of the mountains.

The region of the Coast Ranges includes about the same area as the Great Valley, but a large part of it is so rough that it will always be sparsely inhabited. Toward the north the rainfall is heavy and there is much valuable timber, but southward the timber is scattering and the mountain slopes are mostly covered with brush.

Why was it that the early navigators learned so little of the land lying back of the Coast?

The first navigators who visited the coast encountered many storms and found few places in which they could anchor safely. Much of the shore was rocky and behind it rose steep mountains which barred the way into the interior. Where there were sandy beaches the breaking waves and lack of protection from storm kept them from landing.

If the mountains had extended out into the ocean instead of being nearly parallel with the shore, there would have been prominent headlands with deep bays between them in which to anchor and valleys which could have been followed back into the unknown land.

How did the direction of the Coast Ranges make exploration by land easy?

The Spanish explorers who went northward through the Coast Ranges found few difficulties because of the long, open valleys between the ranges leading almost in the direction in which they wished to go; but since the ranges do not run quite parallel with the coast, it was necessary to cross several of them.

North of Santa Barbara rises the great wall of the Santa Ynez Mountains, blocking the way. The explorers followed the coast until they came to a gap in the mountains which is known as the Gaviota Pass. Then they passed through a country of rolling hills and valleys until they came to the Santa Lucia Range. They crossed this through a low place called Cuesta Pass.

They were now in the Salinas Valley, which led them northwestward as straight as an arrow for one hundred miles. This brought them to the Bay of Monterey. To reach San Francisco another range, known as the Gavilan, had to be crossed; after which a beautiful valley led through to San Jose and San Francisco. This route from San Diego and Los Angeles to San Francisco came to be known as the Camino Real, meaning the King's Highway.

Can we explain why San Francisco Bay is the only good harbor in this region?

On the eastern coast of our country there are good bays extending far into the land where large rivers enter the ocean. This is because the land has sunk so that their mouths are now flooded.

The coast of California has also sunken, but not enough to make deep bays at the mouths of any of the rivers except the Sacramento. At the mouth of the Klamath, the second largest river on the coast of California, there is no bay at all. The Sacramento River flows through a broad, low valley to the ocean, and that is the reason that a slight sinking of the land formed a great bay extending far into the interior.

If the land should continue to sink, other valleys of the coast region would be flooded and we would have many good harbors, but would lose most of our rich valley lands.

San Francisco Bay forms one of the finest harbors in the world. It is so hidden from the ocean that the early navigators sailed past without suspecting that it was here.

How has the scarcity of good harbors and openings through the Coast Mountains affected the growth of the cities of this region?

Because San Francisco Bay forms the only safe deep-water harbor and has in addition easy communication with the interior, its shores have become a great manufacturing and commercial center. Here can be easily brought the products of a vast region for shipment to foreign countries, and from here their products can be distributed over our own country.

San Francisco has, then, advantages which no other place in the Coast Range possesses. Other cities have sprung up along the shores of this region where there are small harbors and bays. Because of the mountains lying back which interfere more or less with travel into the interior, they are supported chiefly by the people of the surrounding country and carry on trade only with San Francisco.

What can we learn as to the position of the watershed of the Coast Ranges and its influence on their settlement?

Strange as it may be, the watershed or water-parting of this region is near its eastern edge, although in places the highest mountains are near the ocean. We have already learned that the main force of the storms is felt on the westward or coastal slope and that the eastern is much drier. Because of these two things the westward slope has large and important rivers, while the eastern has no stream large enough to be called a river. The western slope is, then, well watered; it has many large and fertile valleys and contains most of the population. The eastern slope is thinly settled and poorly watered.

If the watershed of this region had been near the sea, the larger part would have been dry and must always have remained thinly settled.

The rocky coast of Northern California is dangerous in stormy weather. A boat moored off shore is being loaded by cable.

Why are the rivers of the Coast Ranges small in summer compared with those of the Sierra Nevadas?

The rivers of the Sierras rise in regions so high and cold that the clouds drop snow instead of rain. The snow melts slowly and feeds the springs and rivulets far into the summer.

With the exception of a few peaks, the Coast Ranges rise scarcely one-third as far into the sky as do the Sierras and more rain than snow falls on them.

Because of this there are floods in the rivers of the Coast Ranges during the winter or rainy season, while in summer they become very low. In the Southern Coast Ranges the beds of the streams are dry for months at a time.

What influence has the distribution of the rainfall and forests had on the settlement of the Coast Ranges?

The valleys of the North Coast Ranges that lie near the ocean receive so heavy a rainfall that they bear a heavy forest, mostly of redwood trees. These forest lands cannot be settled and cultivated until the lumbermen have removed the trees.

The interior valleys of the Southern Coast Ranges are so dry that crops cannot always be depended upon, and as a result are thinly settled.

We learn then that while too much rain, with the heavy forests that have resulted from it, has hindered settlement in one part, too little rain has had a similar effect in another.

Besides these climatic influences, many valleys are far from any market and without water or rail transportation so that ordinary farming cannot be carried on. The people who have settled in these valleys must depend upon raising stock, which can be driven to market.

For what natural products are Coast Ranges most widely known?

We might mention two products which are known all over our country.

The giant redwood trees (Sequoia sempervirens) are among the wonders of our state. These trees grow to such great size and so close together that the sun can hardly penetrate their forests. They are very valuable for lumber, which is shipped to all parts of the world.

The second important natural product is a mineral. It is known as quicksilver and is found in but a few places in our country outside of the Coast Ranges. We might mention also petroleum or oil as another important natural product of this region.

The Northern Coast Ranges—The Home of the Giant Redwoods.

Introduction.

The Northern Coast Ranges form a sea of mountains between which are innumerable cañons and many small valleys. The central part is drained by Eel River, the northern part by the Trinity River, the southern part by Russian River and other smaller streams.

Along most of the coast is a strip of low land, generally quite narrow and in places cut off by mountains, which here and there rise directly from the ocean. Upon this coastal plain are situated most of the inhabitants. The interior, except that part sloping toward San Francisco Bay and Clear Lake, is thinly settled.

The watershed as well as the crest of the mountains lies close to their eastern edge, overlooking the Sacramento Valley. Here the Yallo Bally peaks rise over 8000 feet.

Why has the settlement and growth of this region been so slow?

A. **The rocky coast line made access by sea difficult:** There is but one safe harbor on the whole coast of Northern California and that is Humboldt Bay. This was formed by the waves throwing up a barrier beach across a bend in the shore at the last sinking of the land. The bay is entered across a bar over which the water is deep enough for large-sized coasting vessels.

Nearly all the coast line of Northern California is formed of jagged cliffs, against which the waves beat continually. Except during quiet summer weather, landing along this coast is quite uncertain,

Sawmill and log boom in a little cove on the Mendocino coast. The cove was made by the sinking of the land and the flooding of the mouth of a small river.

so that the settlement and growth of industries have been greatly hindered.

At many points supplies are taken ashore and produce shipped out in the following manner: When the water is quiet a ship comes as close to the cliffs as it can and anchors. A cable, which has previously been stretched from the shore to a buoy near by, is then made use of to transfer goods to and from the top of the cliff.

B. **The network of mountains has made the building of roads and railroads difficult:** It was not until 1914 that the first railroad connecting Eureka with San Francisco was finished. Up to this time the city of Eureka could be reached only by a long and tiresome stage ride from the head of Russian River Valley down through the basin of Eel River, or by coasting vessel upon the frequently rough waters of the Pacific.

A wagon road extends up the coast from Eureka to Crescent City and thence into Oregon, and another has just been built over a difficult route across the mountains to Redding in the Sacramento Valley.

Why were the first settlements made on the Coast?

Although landing was often difficult upon this rocky coast, yet it was settled before the interior because of two reasons. In the first place, the journey over the mountains was long and difficult; and in the second place, the making of lumber soon became the leading industry.

The redwood forests form a belt a few miles back from the shore, where they are protected from the harsh ocean winds. Short railroads were built, and the logs were carried to the coast, where mills were erected. The lumber was loaded on vessels in the way which has already been described.

Point Arena lighthouse on the flat coastal plain.

The coastal plain forms a strip of almost level land which is in places crowded out entirely by the mountains, while in other places it has a width of several miles. This is often an open, grassy country, and because of the advantages for dairying offered by the cool air and excellent grass it soon became one of the important dairying sections of the state. The butter and cheese produced are shipped to San Francisco by boat.

How does the interior differ from the Coast, and what determined its settlement?

We will start at Eureka and take a journey eastward through the basin of Eel River. We cross first a fertile plain miles in width once covered with heavy redwood forests. Patches of forest still remain and between them appear meadow lands stocked with dairy cattle. For a long distance the valley of Eel River appears heavily timbered, with here and there cleared land. Fruit orchards appear and among them apple trees seem to take the lead.

After a time the redwoods disappear, for the air becomes too dry for them. Spruce, madrone, laurel and oak take their place. Beautiful groves of these trees are scattered over the plateau-like uplands, while wild grasses cover the open spaces.

Here the climate is drier and more agreeable than it is upon the coast, but we seldom see a farm house or cultivated land, since the region is too inaccessible. There is no dairying in these mountains because of the distance to market, but beef cattle and sheep are to be seen everywhere.

Finally, after passing through pine forests, we reach the summit, from which we look down a short, steep slope into the Sacramento Valley. The mountains are here so high that arctic vegetation abounds. There are snowbanks upon the shady slopes.

One of the great sawmills and lumber yards at Eureka.

Why are the rivers of this region of less use than those of the Sierras?

The rivers of the Sierras flow rapidly down through deep canyons. The rivers of the Coast Ranges flow much more gently throughout the most of their course to the ocean and afford little water power. The Sierra streams are needed for irrigation and the snowbanks keep them full far into the summer. In the North Coast Ranges there is little need for irrigation because of the heavy rainfall and the streams become very low in summer because it is only in the higher parts of these mountains that much snow falls.

In what way is the redwood tree very interesting?

The redwoods of the Coast Ranges and the "Big Trees" of the Sierras are among the most wonderful trees in the world and are found only in California. Once they spread over a wide area, but now their only living relative is found in Japan.

The redwoods do not grow as large as the "big trees," nor do they live as long, but some are fully twenty feet in diameter and reach an age of 2000 years. The scientific name of the redwood is **Sequoia sempervirens.** The last word of the name means **always alive.** It is given to the tree because it is so difficult to kill, for sprouts always come up around the stump when the tree is cut.

It is a serious mistake to kill the stumps and clear those slopes which are not needed for farming, for the new shoots grow rapidly

Schooners loading lumber at Eureka.

and soon make trees large enough to cut. If we do not take care there will be no redwood lumber in the future and the tree will become extinct except in the parks where it has been protected.

What led the Russians to abandon their settlement at Fort Ross?

The Russians, who once had fur-trading stations on the Alaska Coast, wished to establish a colony far to the south, where they could raise cattle and grow fresh vegetables. As the Spanish already had possession of San Francisco Bay, the Russians, in 1812, landed at a little cove a few miles north of the mouth of Russian River and built a fort. At this place there is a strip of land about a mile wide, back of which rises range upon range of mountains for fifty miles.

If there had been a river coming to the ocean at Fort Ross, with valleys opening back through the mountains, thus giving the Russians an opportunity to enlarge their settlement, the history of Northern California would probably have been very different.

Because the lay of the land was unfavorable, they abandoned the post after thirty years, and sold their guns and equipment to Captain Sutter, who removed everything to his fort in the Sacramento Valley.

How is it that Eureka has become the most important city on the Northern Coast?

We have learned that for many years this region was accessible only from the ocean. We have also learned that one of the first industries was lumbering and that the valuable forests were near the coast.

There is but one safe harbor upon all the northern coast, and that is Humboldt Bay. Here the level coastal plain is wide and there are many miles of fertile land of the highest value for dairying. Here also the redwood forests are the most extensive and easiest to get at.

What is more natural, then, than that upon Humboldt Bay, where ships can anchor in safety and take and bring cargoes, should grow up the chief city of this northern region? Eureka is now connected with San Francisco by a railroad which will some day be extended northward into Oregon. The city can now be reached easily and has an outlet by which produce can be sent to market much more quickly.

Does "the lay of the land" lead us to look for any other cities in this region?

At the head of the Russian River Valley is the city of Ukiah, which, because it was for a long time the end of the railroad, became an important distributing point for all the Northern Coast Ranges. In all directions are picturesque valleys in which all sorts of fruit do well, while on the mountain slopes cattle and sheep are pastured.

Many people live along the coast west of Ukiah, some of whom are engaged in dairying and stock raising and some in lumbering. Towns have grown up at points where the mills have been built and it is easiest to land supplies from the coasting vessels. The most important of these are Pt. Arena, Mendocino City and Fort Bragg.

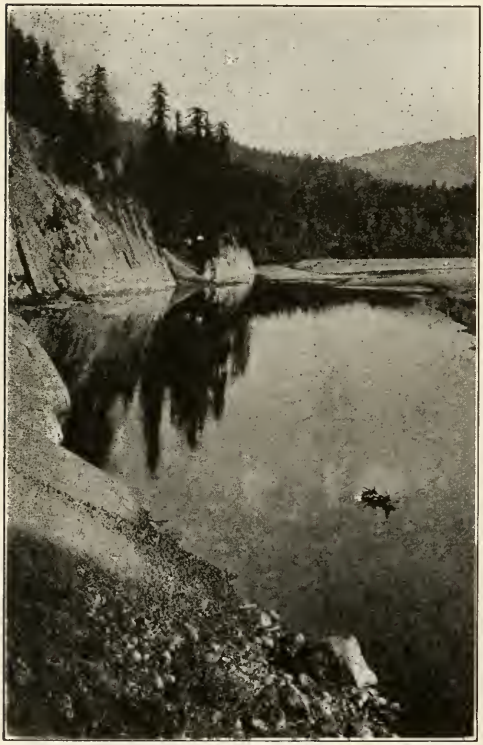
The Clear Lake District: A Pleasant Land of Mineral Springs and Health Resorts.

Introduction.

The region which we are now going to study is a part of the Northern Coast Ranges, but quite different in many ways from that part which we have just discussed.

In the center of the district lies Clear Lake, the largest body of water in the Coast Ranges and one of the largest in California. All about it are picturesque mountains, of which the highest is Konocti, or Uncle Sam, rising over 4000 feet. Far to the south is St. Helena, another volcanic peak of about the same height.

The basin of Clear Lake is interesting, not only for its beauty and its mineral springs, but also because it has really two outlets. Long ago the lake emptied into Russian River by way of the Blue Lakes. Now its outlet is Cache Creek, which flows east into the Sacramento River. We might say that the lake, which has an elevation of 1300 feet, is on the summit of the Coast Ranges and looks both ways.



Eel River at low water.

The agreeable climate, the pretty valleys, the extinct volcanoes and the mineral springs with their health-giving waters, make this region very interesting and it attracts thousands of visitors every summer.

Why do we value mineral springs so highly?

Mineral substances which have great value as medicine are found dissolved in the waters of many springs in California. Such springs are called **mineral springs.** In the Eastern States and in Europe are many such springs so renowned for their curative properties when used either for bathing or drinking that people travel thousands of miles to visit them.

There are hundreds of springs of many different sorts in the Clear Lake region, some being hot and some cold. Among them are soda springs which contain the same gas made in soda fountains. One large spring of this kind boils up in Soda Bay in Clear Lake.

Why are mineral springs so abundant in this region?

If you will place salts of different kinds in cold water and then in hot water you will find that they will dissolve much easier in the hot water. This helps us to understand the origin of mineral springs. Although only a few of them are hot or boiling when they issue from the ground, we are sure that they all must have been so at some point deep in the earth from whence the waters came.

The extinct volcanoes south of Clear Lake tell us why there are mineral springs in this region. The molten rock from which volcanoes and lavas are made comes from deep in the earth where it is very hot.

When water, which is everywhere creeping downward through rock crevices, reaches these hot or molten rocks in the earth, it also becomes very hot and is often turned to steam. Little by little it dissolves some of the minerals contained in the rocks and carries them along with it. In some places the steam pushes the hot water back toward the surface, thus giving rise to mineral springs.

What is the story of the Petrified Forest?

In the mountains at the head of Napa Valley are some wonderful hot springs and many broken trunks of trees that have been turned to stone. Long ago there was a forest growing there. The water of the springs contained **silica,** the substance of which quartz is composed, and when the trees fell the water flowed over them and caused them to turn to stone, or petrify, as we commonly say.

Is the quicksilver of this region also the result of volcanic action?

The silvery liquid of our thermometers is quicksilver. Nature put it in the rocks in the form of a red ore which we have to roast before we can get the silvery metal.

At the eastern end of Clear Lake, opposite Uncle Sam Mount, is the noted Sulphur Bank Mine, where there are valuable deposits of quicksilver and sulphur. Other mines of these minerals and one of gold are found in various parts of this volcanic district.

In one mine the workmen opened a crevice through which boiling water was flowing and the steam and sulphurous vapors almost suffocated them. The sides of the hollows in the rocks were found to be lined with sparkling crystals of sulphur and other minerals.

The quicksilver, sulphur and gold of the Clear Lake region were all deposited from hot or boiling springs.

Why is this region thinly settled, notwithstanding its attractions?

The climate is suited to growing many kinds of fruits, including pears, apples and grapes. Cattle and sheep are raised on the mountain slopes that are too steep for cultivation.

The region is thinly settled, partly because much of it is mountainous and partly because no railroad has yet been built into it. The marketing of produce is difficult and expensive.

The Southern Coast Ranges: Once the Seat of Many Spanish Missions and Vast Ranchos over Which Wandered Herds of Half-Wild Cattle — Now Dotted with Comfortable Homes, Orchards and Grain Fields, and Noted for Valuable Deposits of Petroleum.

Introduction.

We are now going to take up that part of the Coast Ranges lying far to the south. The Northern Coast Ranges, as we have learned, consist of a confused sea of mountains. In the south there are distinct ranges which extend in a regular northwest and southeast direction with long, open valleys between them.

In the north it is very wet near the coast, so that there are dense forests. In the south there is also a heavy rainfall on the Santa Lucia and other of the higher ranges, but the surface is so

The Lower Salinas River showing the shallow channel and the broad valley through which it flows.

rugged that there are few forests valuable for lumber. In the interior valleys the climate is too dry for forests.

In the Northern Coast Ranges the highest land is near the eastern edge, while in the south the highest land is found in the Santa Lucia Range, which rises very boldly from the ocean, reaching at one point an elevation of about 6000 feet.

Why is it that a large part of the Southern Coast Ranges is thinly settled?

1. **Is the land too rough and mountainous for many people to dwell there?** This cannot be the reason, for there are many broad valleys with thousands of acres of fertile land that might support a large population.

2. **Is it because the land is poor and covered with timber and brush?** No, for, on the contrary, nearly all the soil is good, and the slopes which are adapted to farming are covered with wild grasses. Neither do the beautiful oaks which dot the valleys near the coast interfere with the cultivation of the soil.

3. **Is it because of the difficulty of getting produce to market?** It is not difficult to get produce to market from this region, because of the long, narrow valleys extending northwest and southeast throughout its whole length, some of which opened toward San

Artichoke fields in San Mateo County. The most important district for this vegetable in California.

Francisco and others toward the ocean. The building of wagon roads and the hauling of freight through such valleys is easy. Then, in addition, most of the large valleys near the coast can ship produce by boat. Because the ocean is much less stormy here than farther north, wharves have been built where there is some protection from the waves, and during a larger part of the year boats load and unload from them without trouble.

4. **The real reason for the backward development of the southern coast lies in the small rainfall and almost desert climate of the interior valleys:** We have already learned that where the rainfall is too light to grow crops that a few people can nevertheless make a living by raising cattle. They lack many comforts and advantages, for their homes must be far apart, since it takes thousands of acres to support a herd of cattle in such a region.

How does the rainfall affect the distribution of the people?

The driest part of the Southern Coast Ranges is the Carrisa Plain, which lies farthest from the ocean and is almost uninhabited. This plain is very interesting because it is a true basin with a rim of high land all about it, enclosing a salt marsh in the center. It has never rained much in this region, or the basin would have been turned into a lake and a stream would have flowed away to the ocean.

As we go toward the coast we find the rainfall increasing and with it the number of settlers. The main river valleys which lead down to the ocean contain more people than the immediate coast, for here between the dry interior and the damp, cool lands next to the ocean we find the most agreeable climate, adapted to the growing of a great variety of products.

How does the rainfall affect the occupations of the people?

Cattle raising was once the only occupation, because there was no market for other products. Now the raising of beef cattle is largely confined to the drier and more mountainous parts of the Southern Coast Ranges.

Wheat fields have taken the place of herds of cattle in the vast rolling hills and valleys of the upper Salinas River Basin, in the Santa Ynez and other valleys, where irrigation has not yet been developed, and there is scarcely rain enough for diversified farming and fruit growing.

It is in the large valleys lying near the coast where there is abundant rain, and yet protection from the fogs, that we find a climate which is not only very agreeable but adapted to the growing of a great variety of products. Here, then, we find the densest population and most of the towns.

The San Benito, San Juan, Pajaro, Upper Salinas, San Luis, Santa Maria and Lompoc Valleys produce large quantities of pears, peaches, prunes and apples.

In the Pajaro Valley are produced great quantities of berries, which are largely disposed of in the San Francisco markets. Watsonville is noted as the most important apple growing district in California. The slopes of the Santa Cruz Mountains lying back of Watsonville are protected from the cool ocean winds and are especially suited to apples.

The bottom lands of the valleys between the fruit belt and the ocean have a climate and soil adapted to the production of sugar beets, potatoes and beans. Important beet sugar factories are located in the Salinas and Santa Maria Valleys.

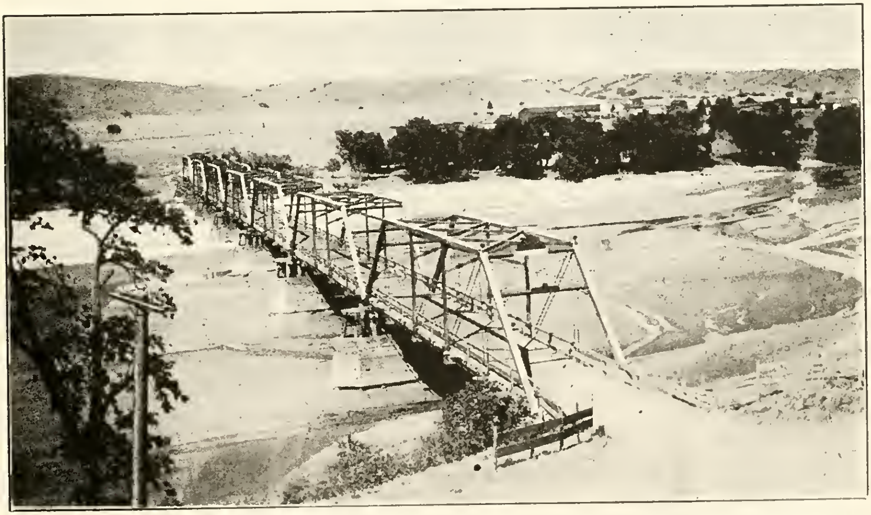
The hills and smaller valleys bordering the coast are given over largely to dairying. The abundant grasses of this region, the cool air and the opportunity to ship butter to San Francisco by boat make this industry profitable here.

Why are the rivers of this region almost dry for a large part of the year?

The three most important rivers are the San Benito-Pajaro in the north, the Cuyama-Santa Maria in the south, and the Salinas in the middle.

The Salinas River drains an area as large as the basin of Eel River, but during much of the year its broad bed throughout its middle course is covered with drifting sand. The Santa Maria River is equally dry in summer. After the heavy rains of winter there is a great change. Their channels become filled with a muddy flood which sometimes does serious damage.

We judge, then, that the mountains in which these rivers rise are not high enough to receive much snow; and that when the rains come the water gathers quickly and runs away to the ocean. We judge also that the summers are long and dry, and that most of the water which the streams then carry is evaporated by the hot sun.



Bridge across the Salinas River at King City. The channel is dry in summer.

In what way can the interior valleys be made to support a larger population?

It will be necessary, as in many other parts of California, to build great reservoirs in order that the winter floods may be held for summer use, and extensive canals to carry it to the parched lands. The climate is healthful and the soil fertile, but more water is needed if many people are to make comfortable homes in this region.

What has the lofty Santa Lucia Range to do with the dry interior?

The Santa Lucia is the boldest and loftiest range on the whole coast of California. It rises so abruptly from the ocean that travel along the seaward slope is possible only over the roughest trails. These mountains form such a great storm barrier that nearly all the region to the eastward across the whole Coast Range region is very dry.

Why were the Missions built where they are?

The Padres as they explored the Coast Ranges were not looking for mission sites which had commercial advantages. They sought, rather, for places where there was water, fertile land, and opportunity to teach the Indians.

At this time California was far away from any source of supplies. It was necessary to grow in the mission gardens everything that was needed in the new settlements. To do this in the dry summers of this region water for irrigation was a necessity.

Did towns grow up about all the Missions?

The sites of some of the missions proved to be of commercial importance and towns grew up about them.

Santa Barbara is on the ocean near a partially protected bay and in the midst of a fertile coastal plain.

San Luis Obispo lies in the midst of a beautiful valley and is a natural site for a city. A few miles away is Port Harford, the shipping point for this district, where a rocky point and breakwater make it possible for boats to load at any time.

Monterey is situated upon the great Bay of Monterey and is well protected from southerly gales. Until San Francisco Bay was discovered, Monterey was the best known bay on the coast of California north of San Diego.

Santa Cruz, also the site of a mission, lies on the opposite side of the Bay of Monterey. It has now become a noted summer resort. Back of it lies the Santa Cruz Mountains, whose groves of redwoods form attractive resorts.

San Juan Mission occupies a fertile valley on the Camino Real and a small town grew up about it.

Santa Clara, which is favorably situated in the center of a large valley now thickly settled, has grown into a city.

How is it that Monterey did not become the metropolis of the new State of California?

Monterey lies to the west and some miles away from the Camino Real. It has little farming land about it and is the shipping point for only one valley (Carmelo). It has none of the advantages of easy communication with the interior, or of a thoroughly protected harbor such as San Francisco has.

Although Monterey was one of the two most important Spanish towns, and the leading seaport at the time of the discovery of gold, it was, for the reasons given above, very little affected by the rapid growth of California.

Monterey has, however, become the most noted summer and winter resort upon the coast. Adjoining it is Pacific Grove, an attractive camp ground in a forest of pines. One of the most beautiful drives in California extends past the Point of Pines along the rocky shore to Carmelo Bay.

What attractive scenery do we find in the Southern Coast Ranges?

The grandest natural monument upon either the Atlantic or Pacific Coast of our country is Morro Rock, a few miles northwest of San Luis Obispo. This is a precipitous island of bare rock, rising nearly 600 feet above the water of the ocean.

The rock is of volcanic origin and belongs with a series of "buttes" which extend inland to the town of San Luis Obispo. Though they are not more than 1500 feet high, these buttes form very picturesque features of the landscape.

The grandest mountain scenery of the Southern Coast Ranges is found along the seaward face of the Santa Lucia Range. Because of the steepness of the slopes and the depth of the cañons, few people live in these mountains.

Many people are attracted to this region because of the mineral springs.

The Southern Coast Ranges contain numerous hot sulphur springs which are highly prized. The waters of some of these springs are used for bathing and of others for drinking. Most noted are the hot springs and mud baths at Paso Robles. These springs are due, not to volcanic action, as are those in the north, but to chemical changes deep in the earth. That chemical changes produce heat is shown when lime is being slaked in the process of making plaster.

What can we learn of the story of this region from the great oyster shells on the mountains?

Near Santa Margarita, and in many other places, there are beds of many kinds of ocean shells, among which are those of giant oysters.

These shells tell us that long ago the Coast Ranges were beneath the ocean with only islands sticking up above the water. In the shallows about the shores of the islands the oysters once lived. Then the ocean bottom sank and they were buried in sand. After long ages and many earthquakes the sea bottom was raised to form the mountains which we have been studying. The rains washed the sands away and the oyster shells were exposed.

What do the caves in the ocean cliffs tell us?

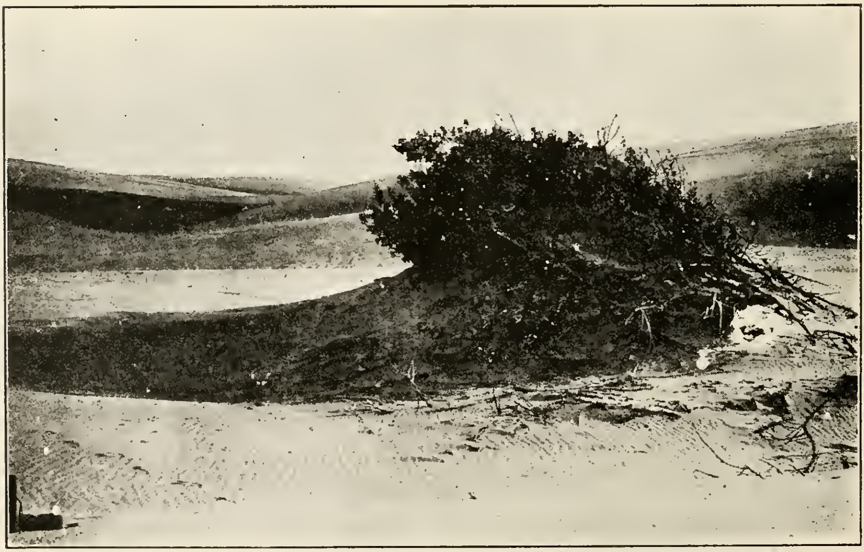
Near Port Harford there are caves in the ocean cliffs above the present level of the water. In some of them there are water-worn pebbles. The caves teach us that the level of the land is changing, for they were made when it was not so high as it is now.

The tidal lagoons along the Coast tell another story.

At Morro Bay and Port Harford there are tidal lagoons reaching back into the land. These occupy partly submerged valleys and were made by a sinking of the land in the same manner as was San Francisco Bay. If the land had sunk farther many landlocked bays would have been formed upon the coast.

The Channel Islands.

The Channel Islands, lying off the coast of Santa Barbara, are, as we have already learned, the remnants of a submerged mountain range which was once a part of the mainland.



Sand dunes near San Francisco, showing how vegetation helps to hold the soil from drifting.

Because most of the surface of the islands is rough with little good soil, and because water is very scarce, they have remained uninhabited, and are used mainly as pastures for sheep.

When the whites first came, the islands were peopled with many Indians, who lived mainly upon fish and shell fish, and were in some ways superior to the Indians upon the mainland.

Why is there so much oil in the Coast Ranges and so little coal?

The reason is that while oil or petroleum comes from rocks which were formed in the deep ocean, coal is formed from the vegetation which once collected in marshes on the land.

The ocean which, long ago, covered the region of the Coast Ranges was filled with little organisms so small as to be hardly visible. As these organisms died their bodies accumulated in beds thousands of feet thick. Then the ocean currents washed mud and sand over them and buried them deeply. After a time the beds containing the bodies were made very warm and began to give off oil and gas which collected in sandy layers.

The Santa Maria oil field in Western Santa Barbara County is one of the most valuable in California. To reach the oil some of the wells have been drilled 4000 feet into the earth.

In what different conditions is the oil found?

The gas which comes from oil wells has great value as fuel for steam engines, for running gas engines and for fuel. This gas contains the more volatile parts of the oil, such as gasoline.

The oil which forms what is known as "tar springs" is dark and thick. When oil becomes dried out to such a degree that it is hard at ordinary temperatures, it is called **asphaltum.** It occurs in veins in the earth and is also produced in the refining of oils.

Near San Luis Obispo there are great beds of what is known as **bituminous rock.** This rock is formed by oil creeping into porous sand rocks. Bituminous rock is quarried and used very widely as a pavement for city streets.

What other minerals are found in the Southern Coast Ranges?

Valuable mines of quicksilver are worked at New Indria in San Benito County and at New Almaden in Santa Clara County. Coal is mined in the mountains west of Coalinga, and a little gold is found in the Santa Lucia Range.

San Francisco Bay and the Region About: A Magnificent Land-Locked Bay, the Gateway to California, with Arms Reaching Out Into Fertile Valleys Set Among Picturesque Mountains.

Introduction.

San Francisco with its connecting bays occupies what was once a group of valleys in the Coast Ranges through which flowed the Sacramento River.

San Francisco Bay is more than fifty miles long from north to south and in places is twelve miles mide. A part of the shore is flat and marshy. In other places steep hills rise in a picturesque manner from the shore, while here and there are rocky islands.

The largest ships can pass through the Golden Gate into the bay, while the different arms permit the smaller river boats to reach the great interior valleys.

What interesting thing about the history of San Francisco Bay can we learn from the Indian shell mounds?

The Indian mounds are made up of refuse shells and bones where the Indians used to gather for their feasts. The bottoms of two of these, one in Shell Mound Park and the other known as the Ellis Mound near Richmond, are about thirteen feet below high tide.

This interesting fact teaches us that since the Indians first came here the land about San Francisco Bay has sunken. Long ago the land stood so much higher that there was no bay at all, and the Sacramento River flowed through fertile valleys out to sea. Its mouth was then outside the Farallone Islands, for the water between them and the shore is now so shallow that if the land should rise 200 feet they would become a part of the mainland.

How has the sinking of the land made San Francisco Bay the Gateway to California?

We have already learned that the Sacramento is the largest river wholly in California and that it drains all the central part. When the land sank the sea came in through the Golden Gate and flooded the river valley entirely across the Coast Ranges and into the Great Valley so that the tide is now felt as far as Sacramento and Stockton.

The sea also flooded the adjoining valleys of the Coast Ranges so that boats can go to Petaluma, to Napa, and almost to San Jose. Thus the sinking of the land opened a gate from the ocean through the coast mountains into the heart of California, making nearly half of the state easily accessible to trade and commerce.

Why was it that this great bay remained so long undiscovered?

If you should sail along the coast on some foggy day when the shore was indistinct, it would be the easiest thing in the world to go past San Francisco Bay and not see its narrow entrance. This is probably the reason why Drake in 1579, and Vizcaino in 1602, sailed past the Golden Gate and anchored in a little bay a few miles to the northwest, which is now known as Drake's Bay.

How is it that the Strait of Carquinez, although an obstacle to land travel, is yet of great importance commercially?

The Strait of Carquinez, Suisun Bay, and the marshes to the east are a serious barrier to rail and wagon roads. One of the largest ferry boats in the world is used to carry trains across this strait between Benicia and Port Costa.

The strait is of great importance because the large sea-going ships can come up through the bay as far as this point and receive their cargoes direct from the vast grainfields of the Great Valley. Here lumber is brought from the coast ports for trans-shipment to the interior. Here grain is made into flour to be shipped abroad. Here are sugar refineries and smelters.

No other place in all California is destined to become of so great importance commercially because of the favorable situation for interchange of foreign and home products and for manufacturing.

How can we account for the many different sorts of climate within a few miles of San Francisco?

The gap in the mountains through which the Sacramento River reaches the ocean permits its cool winds to reach far inland. During the long days of summer the air of the Great Valley becomes very hot. The heat makes it so much lighter that the cool heavy sea air rushes in and takes its place. This creates a strong wind which in San Francisco and on the bay is so sharp that an overcoat is sometimes comfortable in the middle of summer. This wind is like the draught in a great fireplace.

Although the summer climate of San Francisco and the adjoining bay region is sometimes unpleasantly cool, it is nevertheless healthful and invigorating. Most fruits and vegetables thrive in the damp air, but some require more sunshine and warmth.

San Francisco Bay and Mt. Tamalpais from the Berkeley Hills. This bay was formed by a sinking of the land.

We will now take a train from San Francisco and go either south behind the protecting ridge of the Santa Cruz Mountains, or cross the bay to Sausalito and go north behind the Mt. Tamalpais Ridge, or eastward from Oakland through the Contra Costa Hills, and in less than an hour we are in a climate so different that we are almost ready to believe that we have been suddenly transported hundreds of miles. In the valleys which we have reached on our short journeys there is often fog at night, but the days are warm and sunny. Vineyards and orchards of many kinds of fruit are all about us, and we even see orange trees with their golden fruit.

We must not expect the winters about San Francisco to be cold because the summers are. The days of fall, winter and spring are often warmer than those of summer, although the nights may be frosty.

During the winter there is no strong sea wind. This is the season for storm winds which blow from different directions.

What important effect did the making of San Francisco Bay have upon the bordering country?

1. **Much fertile valley land was flooded:** Several hundred square miles of the best valley land was overflowed by the sea when San Francisco, San Pablo and Suisun Bays were formed. The value of the waterway opened for ships into the very heart of Cali-

Looking in through Golden Gate from Fort Point.

fornia is, however, much greater than that of the land that was lost. Besides this the remaining land was made more valuable because of the great population attracted here by the advantages for manufacturing, trade and commerce.

2. **The sinking of the land led to the building of river deltas:** The delta lands of the Great Valley which were made by the Sacramento and San Joaquin Rivers as they filled up the ancient Suisun Bay are larger in area than all three of the bays which we have mentioned, and will some time support a great population.

The formation of this delta with all its rich acres is directly due to the sinking of the land. If it had not been for the large body of water forming the ancient bay, the mud or silt which the rivers brought down from the mountains would not have been dropped and the delta would not have been formed. The silt would have been carried on to the ocean and lost to us.

The Columbia River pours its muddy flood directly into the ocean, discoloring the water for many miles out, for it has no quiet water in which to drop its load of silt. The Colorado, about which we shall learn later, has formed thousands of square miles of the richest land in the head of the ancient Gulf of California.

3. **About San Francisco and San Pablo Bays are tidal marshes where great numbers of ducks and other water birds are found:** Tidal marshes border much of the lowland about San Francisco and San Pablo Bays, and fill their many coves and arms. A part of this overflow land is bare mud at low tide and a part is covered with salt water grasses. Some day the water will be shut out of the marshes by dikes and the rich soil will be cultivated.

The vast stretch of the Suisun marshes—the delta of the Sacramento-San Joaquin Rivers.

Untold numbers of ducks once stopped in the marshes upon their migrations to the north or south. They have been hunted so much that they are now nearly gone. Greater protection must be extended to these game birds or we shall lose them entirely.

Tidal channels were formed which are very useful for the transportation of produce to market from the surrounding valleys. If you will examine the map of San Francisco and San Pablo Bays you will see small streams leading through the marshes to Petaluma, Napa, San Rafael and Alviso. Each of these is the water outlet of an important valley or town.

These streams are, however, too small to be used by boats if it were not for the tide. At high tide they are deep enough for small steamers which carry on an important business, especially with the two towns first mentioned.

How has the presence of San Francisco Bay influenced the settlement and occupation of the people in the region about?

1. **Since San Francisco Bay is so safe and commodious it has become an important commercial center:** San Francisco Bay lies almost midway between San Diego in the south and Puget Sound in the north. In most respects it is the best harbor upon the Pacific Coast. Because of its position and character a large part of our commerce with the countries of the Pacific Ocean must come here.

Since San Francisco Bay is such a favorable point for ships to take and discharge cargoes, railroads were needed to bring freight

Palace of Fine Arts, San Francisco, one of the most beautiful buildings in the world.

and distribute it over the country. Then manufactured products of many kinds found a market here as well as a distributing point and so great plants were erected to do all kinds of work.

All these things required much labor and so thousands of people came. Towns and cities sprang up, the largest of which is San Francisco.

2. **The growth of a great population on San Francisco Bay is also favored by the open route into the interior:** If there had been a lofty mountain range between San Francisco Bay and the interior it would not have become an important center of commerce. As it is, however, large ocean boats can go up through the Coast Ranges to the Strait of Carquinez, where they can receive direct the produce of thousands of acres of fertile land.

3. **The coming of a great population makes the bay region an important market center:** The people of the cities which are growing up about San Francisco Bay need large quantities of food. If we turn either to the north, to the east, or to the south, we find rich valleys branching out from the bay in which food supplies of all sorts are grown. From these valleys produce can be quickly and cheaply sent to market, either by boat or by railroad.

The needs of the cities determine also the sort of farming carried on in the adjoining valleys. Vast quantities of fresh fruits and vegetables are required every day by the cities of the bay region and they must be raised near by so that they will be fresh and cheap.

Consequently the most important farming carried on is gardening and truck farming, the raising of chickens and the growing of small fruits and berries of all sorts.

4. **The marsh lands favor the making of salt:** About Alvarado upon the eastern side of San Francisco Bay there are extensive plants for the making of salt from sea water. At high tide the water is allowed to flow into large, shallow ponds. Then the openings are closed until the water has partly evaporated. This is repeated until a strong brine is formed. The salt finally crystallizes on the bottom and is shoveled out.

5. **The sinking of the land favored the growth of important fishing industries:** When the land stood so high that the shore line was outside the Farallone Islands there was little shallow water along the coast of California, for the bottom descended rapidly to the deep Pacific.

When the land sank, the lowlands along the coast were submerged, making the continental plateau or shelf over which the water was shallow.

As nearly all the food fishes which the fishermen get either by means of hooks and lines or by nets live in shallow water, the sinking of the land gave an opportunity for a vast increase in the numbers of fish along our shores and in the bays which were formed.

Many hundreds of men are engaged in catching fish for the San Francisco market and for shipment into the interior.

The Santa Clara-San Benito Valley: Once a Wild, Oak-Dotted Park, But Now a Garden of Fruits and Flowers: The Largest and Richest of All the Coast Range Valleys.

Santa Clara is sometimes called the Garden Valley. In the spring a flower festival is held at which time hundreds of square miles of blossoming prune trees present a wonderful sight. In summer the vast seed farms with their many colored flowers present an equally pretty sight.

The Santa Clara and San Benito Valleys are really one, for as you go southeasterly from San Jose you cannot tell when you leave Santa Clara and enter San Benito Valley. They lie end to end just as do the Sacramento and San Joaquin Valleys, but while the two latter drain through one common outlet to the ocean, the two former are separated by a slight watershed. Santa Clara Valley drains into San Francisco Bay, and San Benito Valley empties through the Pajaro River into Monterey Bay.

In the heart of Santa Clara Valley lies the Mission of Santa Clara. For many years the park-like region about it served only for grazing cattle. Then with the coming of more settlers grain growing became the important industry. Now the valley has become a garden of fruits and flowers. Three miles to the eastward of the mission and town of Santa Clara lies the city of San Jose. This city, like Los Angeles, was founded as a Spanish Presidio. The city is only eight miles from the end of the southern arm of San Francisco Bay, with which it will some day be connected by canal.

Point Reyes; one of the most dangerous points on the coast of California.

Near the northern end of the valley and on the west side of San Francisco Bay is Stanford University, with its beautiful buildings in the old Spanish style.

The climate of the whole valley is agreeable, for the Santa Cruz Mountains partly break the cool ocean winds, and we find growing here almost every sort of fruit that California produces.

The Russian River and Santa Rosa Valleys: A Favored Region Whose Beauty, Climate and Fertility Have Made It Known Far and Wide.

The Russian River and Santa Rosa Valleys occupy about the same position north of San Francisco Bay that the Santa Clara and San Benito Valleys do on the south. The rainfall of these northern valleys is, however, greater, but their climate is fully as mild because of the shelter offered by the Coast Range between them and the ocean.

Upon either side of the two main valleys are smaller ones, while between and back of all are picturesque mountains. Some of their slopes are open and grassy and used for grazing cattle and sheep; others are covered with groves of oak, madrone, laurel and redwood.

The lower hills have been found best suited to the growing of grapes, of which there are many thousands of acres. Upon both the hill slopes and in the valleys fruits of almost every sort found in California are grown in abundance. The lowlands of the

In a Hopfield, Russian River Valley.

middle part of the main valley are noted for their extensive hop fields.

Vineyards, orchards and hop fields are three things for which Russian River and Santa Rosa Valleys are famous. Almost equally noted is Sebastopol and the region about for its spicy scented gravenstine apples which here reach perfection.

So sunny and free from frost are portions of the lower Russian River and Santa Rosa Valleys that oranges and lemons of a good quality are now being grown here in commercial quantities.

Near Santa Rosa, with a favorable climate and soil, Luther Burbank has developed his new and valuable plants.

Many who do not have homes in this pleasant region come here for the summer to drink and bathe in the waters of the mineral springs, and to camp along the wooded mountain streams.

Russian River does not continue on southeasterly through Santa Rosa Valley and empty into San Francisco Bay, as one would think it should, but turns to the west through the hills and empties into the ocean. Thus the city of Santa Rosa has grown up, not because it has water connection with San Francisco, but because it is in the midst of a large and thickly settled valley. The situation is somewhat like that of San Jose, although the latter makes some use of the port of Alviso, eight miles away.

At the lower end of Santa Rosa Valley there is a town which, like Napa, has become important because it is situated on a creek

On the beach at Santa Cruz.

navigable at high tide, thus affording an outlet for produce to San Francisco.

This town, known as Petaluma, is noted as a center of the poultry business in California. Cheap freights, a favorable climate and well-drained soil have brought this about.

Sonoma Valley: Where Was Built the Most Northern of the Missions.

If we go easterly from Santa Rosa around a range of mountains, we come to another valley for which Nature has done much. The Mission Fathers thought this a most favored spot and built here the last and northernmost of the missions. They set an example for the American farmer, who was to come later, in putting out vineyards and orchards.

Sonoma is widest known for the fact that here in 1846 was raised the "Bear Flag" in the first effort to free California from Mexican rule.

Napa Valley: Sometimes Called "The Beautiful Valley."

Continuing northeasterly from Sonoma we climb another range of mountains and from its summit look down upon a region which well deserves the name "Beautiful Valley." Vineyards and orchards and comfortable homes lie scattered along the main valley and upon the rolling hills which border it, while back of all rise partly forested mountains.

The valley extends from San Pablo Bay in a northwesterly direction parallel to Russian River, and reaches to the foot of Mt. St. Helena, almost half way to Clear Lake. To the northeast many mountains and small valleys still have to be passed before we come to the Sacramento Valley.

The attractive scenery, the pleasant climate, which is neither too hot nor too cold, the many mineral springs in the mountains, and the fact that almost every sort of fruit grows there, makes this valley one of the best of the many happy vales of California.

Napa is the chief town because of its situation upon the Napa River, by means of which it receives passengers and freight from San Francisco. As we go down the river we pass upon the left the towns of Benicia and Vallejo. Benicia was for a time the capital of California. Upon the right of the river, where it enters the bay, is Mare Island with its navy yard.

The valleys that lie under the shadow of Mount Diablo.

From Vallejo we will cross the Strait of Carquinez, and passing the town of Martinez, go up to Ygnacio Valley under the shadow of Mt. Diablo. On the way we pass the spot where John Muir lived, the man who has written so much about our mountains and worked so long to preserve their beauty.

Continuing from Ygnacio Valley around the west side of Mt. Diablo through an orchard country, we come to San Ramon Valley, and then the broad Livermore Valley, which lies south of the mountain. Now grainfields and orchards line our road until, turning down through the picturesque Niles Cañon, we come out in the Santa Clara Valley on the eastern side of the bay. Between this point and Oakland we pass through several towns surrounded with vegetable gardens and orchards.

After the discovery of gold the main route from Southern California to the mines was along the Camino Real to San Jose. From this point it led through Niles Cañon, Livermore Valley, and over Livermore Pass.

Livermore Pass is the lowest gap in the whole length of the Coast Ranges except that at Carquinez. One branch of the Southern Pacific Railroad now follows the route of the old stage road.

Mt. Tamalpais and the valleys that nestle about it.

If we would escape the cool fog of a summer day, all that we have to do is to climb or take the scenic railway to the summit of Mt. Tamalpais. On its top, 2586 feet above the sea, we are in the clear, warm air, while the fog rolls below us like the waves on the ocean. Most mountains are colder than the valleys at their base, but it is just the reverse during the summer on all the high mountains which rise along our coast.

When the fog has gone, the whole bay region lies spread out before us like a map. We see the islands, the peninsulas, the coves with their mud flats and winding tidal streams, the towns, boats and other signs of the presence of men.

On the south of Mt. Tamalpais is Muir Woods, a national park with its grove of great redwood trees. Close under the highest

Mt. Diablo, from Walnut Creek.

peak are Ross and Mill Valleys with homes set among redwoods, while farther away is San Rafael.

From the western shoulder of the mountain we look down upon the bay and town of Bolinas, and away beyond them Point Reyes may be seen extending far out into the ocean. Southward are the Marin Hills, covered with dairy cattle, and beyond them the Golden Gate.

Mount Diablo: The great landmark of the Central Coast Ranges.

As we cross the Great Valley in the direction of San Francisco, the first thing that attracts our attention is Mt. Diablo with its double peaks standing up all alone. From its top nearly 4000 feet above the sea there is a magnificent view reaching to the snowy mountains far to the east and north.

Mt. Diablo is also interesting because it is the point from which all land measurements in Central and Northern California start. Mt. San Bernardino is used as a base for measuring the lands of Southern California.

The Santa Cruz Mountain region: Renowned for its redwood forests and its agreeable summer climate.

When the Santa Cruz Mountains are mentioned, we think of camping among the redwoods or of pleasant homes on the mountain slopes with orchards of apples set about them.

The cutting of the redwood forests has been an important industry for many years in this region. Now people have come to love these trees and the finest remaining forest has been set aside by the state for public use and named Sempervirens Park.

Along the ocean side of the mountains the broad, grassy slopes and cool air make dairying an important industry. Upon the eastern and southern slopes there are orchards of different kinds of fruit, the apple being the most important.

The city of Santa Cruz attracts many summer visitors because of the fine sea bathing. Others spend their summers in the redwoods back of the city or at Half Moon Bay and Pescadero.

The Mt. Hamilton Range: The seat of the Lick Observatory.

Those who study the stars must have clear air for their work, and as there is so much fog and haze in the air of the lowlands it is better for them to resort to some mountain top. For this reason the Lick Observatory was placed upon Mt. Hamilton, whose summit is 4209 feet above the sea.

Mount Hamilton is the highest peak of the lofty range which shuts in Santa Clara Valley on the east. From its summit we look across a sea of mountains to the San Joaquin Valley. In this rugged region the slopes are steep, the valleys are small and the rainfall becomes less the farther we go from the ocean. For these reasons few people live here and they are engaged in stock raising.

The islands of San Francisco Bay.

When the land sank and San Francisco Bay was formed, several of the hills which rose in the valley of the ancient Sacramento River were entirely surrounded by water and made into islands. Others were just covered by the water and formed reefs very dangerous to ships until they were blown out by powder.

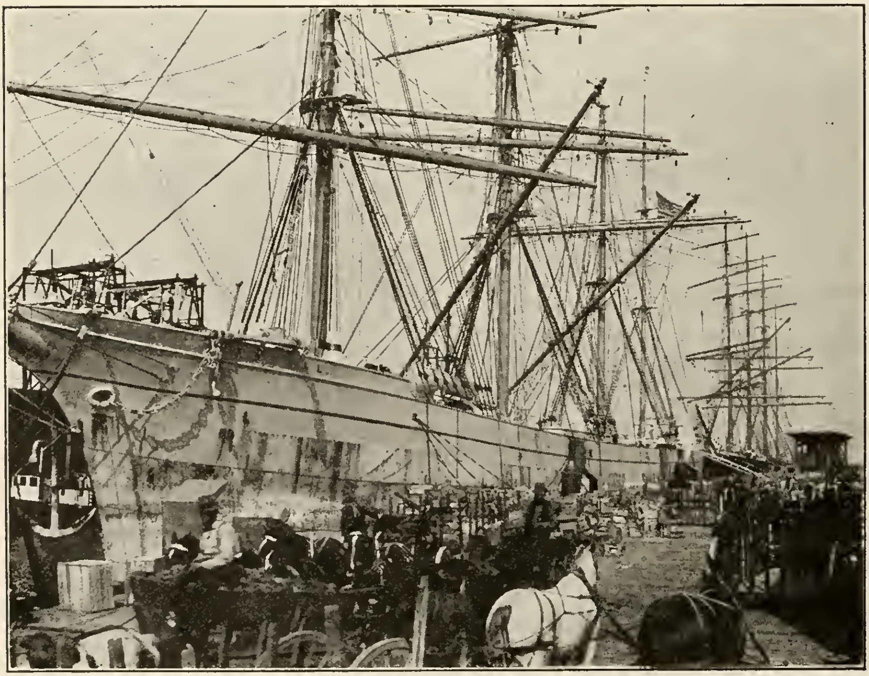
Angel Island is the largest and is used as a quarantine station. Here people infected with disease are landed from the ships and are kept isolated until danger of contagion is past. Alcatraz lies directly in the middle of the entrance to the bay and is used as a fort and military prison. Goat Island has a lighthouse and naval training station.

The beginnings of San Francisco.

It was not until 1775, six years after Portola had looked down from the Santa Cruz Mountains, that the first ship entered the bay. The commander of the San Carlos made a camp on Angel Island and explored the shores as far as the mouth of the Sacramento River.

In 1776, the very year of our Declaration of Independence, the Spaniards chose a rocky point overlooking the bay for a presidio. This place is now known as Fort Point.

A spot for the Mission Dolores was selected in a little valley



The San Francisco water front.

lying two miles to the south and midway between the ocean and the bay.

After a time a little settlement sprang up on the shore of a cove on the eastern side of the peninsula about four miles from the mission. This was named Yerba Buena, after a fragrant mint which grew among the bushes on the sandy slopes. As late as the year 1846 the population amounted to less than two hundred.

Everything quickly changed after the discovery of gold. The quiet bay became alive with the shipping of every nation and the little village of Yerba Buena grew into the city of San Francisco almost in a night. In July, 1848, five hundred square rigged ships lay anchored off Montgomery street.

The appearance of the bay and city in 1849.

Bayard Taylor, a noted writer who came by the Isthmus, says: "We are in front of the entrance to San Francisco Bay. The mountains on the northern side are 3000 feet high and come down boldly to the sea. As the view opens through the splendid strait, three or four miles in width, the island rock of Alcatraz appears glistening in the distance. High through the vapor in front, and thirty miles distant, rises the peak of Mt. Diablo, which overlooks everything between the Sierra Nevadas and the ocean. At last we are through the Golden Gate—fit name for such a magnificent portal to the commerce of the Pacific. Yerba Buena Island (now Goat Island) is in front; southward and westward opens the renowned harbor, crowded with the shipping of the world, the flags of all nations fluttering in the breeze. Around the curving shore of the bay and upon the sides of three hills, the town is planted and seems scarcely yet to have taken root, for tents, canvas, plank, mud and adobe houses are mingled together with the least apparent attempt at order and durability."

How San Francisco appeared in 1854.

A few years later another writer says of San Francisco: "Many parts of the city have now the appearance of an old town and, in passing through them, one often forgets that he is not in New York or Boston. The crowds on the sidewalk, the rattle of trays, the display of hacks, the roll of omnibuses, the ringing of bells, the fruit stands on the corners of the streets, the cries of various peddlers of small wares and nicknacks, the long wharves loaded with merchandise, and the spacious harbor dotted all over and alive with the shipping of every clime, indicate a city the origin of which might be covered with the dusts of time. But this is San Francisco and these are the evidences of its energy and thrift, in the fifth year of its existence."

Where did the people of San Francisco obtain their food supplies during the gold excitement?

We have learned that during the Spanish period very little land was cultivated because there was no market for produce. For some time after the discovery of gold few people could be induced to work the farms or assist in the growing of fruits and vegetables, which were so much needed. All who could do so, left their work, no matter what it was, and started for the mines where they hoped to get rich.

Vegetables and tropical fruits were brought from the Sandwich Islands, apples and pears from South America, butter, cheese, eggs and bacon from New York and Boston, and a large variety of cured provisions from China. Ice was brought from Boston and from the Alaskan Coast. Large quantities of gulls' eggs were collected along the coast and used in the place of hens' eggs.

In the course of a few years, however, many men left mining and went back to farming. In the gardens of the Sacramento and Santa Clara Valleys vegetables of all sorts began to be grown, although prices remained high for a long time.

How is it that San Francisco, having so many natural advantages, had not become an important place before the discovery of gold?

Looking down Market Street, San Francisco.

San Diego, Los Angeles, Santa Barbara and Monterey were old towns before there was any settlement except a mission and fort where San Francisco now stands. The bay region was on the outskirts of the settled portions of California and, although there were a few ranchos along its shores, the vast country to the north and east was almost uninhabited except for the Indians.

There was here, then, nothing to support a town; there was no business and no occasion for ships to enter the bay, since they could neither dispose of goods nor carry any away. The Spaniards who lived comfortably upon their great ranchos were satisfied with things as they were and did not try to build up the settlements or trade of the country.

When gold was discovered everything was changed. San Francisco was found to be the only large and safe harbor within reach of the mines, and for thousands who came by water, the bay and river offered a convenient way for continuing their journey almost to their destination.

How is it that the most important city of the bay region is situated upon a long, narrow peninsula instead of upon the Contra Costa or Marin shores?

The Mission and Presidio were established upon the peninsula because, in the first place, they could be reached directly by land from the older settlements to the south, and in the second place, the situation was a commanding one at the very entrance to the bay.

The little cove where the town of Yerba Buena sprang up offered the best landing for boats and was the most protected from storms of any spot near by and was also close to the entrance to the bay. Upon one side of the little bay the land rose very steeply to Telegraph Hill, but upon the other sides the slopes were gentle and suited to build upon.

Although the water is deep close to the Marin shore, there is no room there upon the lowland for the growth of a great city, for the hills rise steeply almost from the water's edge.

The Contra Costa shore is, on the contrary, broad and gently sloping, but the water is in most places very shallow for a long distance out and large boats cannot come close to the land.

What are the disadvantages in the situation of San Francisco and how can they be overcome?

San Francisco lies at the northern end of a long, narrow pen-

Stow Lake, Golden Gate Park, San Francisco.

insula and can be reached by land only from the south. There is, then, but one direction in which it can grow. Freight and passengers coming and going in other directions have to be transferred by ferries across the bay. To meet this need large and comfortable boats are run to Alameda, Oakland, Berkeley, Richmond, Sausalito and Tiburon.

In order that the thousands of people who have their homes on the Contra Costa side, but whose business is in San Francisco, may cross the bay more quickly and safely, it is proposed to build a tunnel under the bay. That freight may reach and be sent from the city more easily, a railroad has been built across the southern arm of the bay.

For what is San Francisco particularly interesting?

City Hall, Oakland.

The rise of San Francisco from a little hamlet of a few houses to a great city during the gold excitement is a story more wonderful than that of any other city in our country.

San Francisco is interesting because of its commanding and picturesque situation. From the hills over which it has spread there is a view of the sea, of the bay and of the mountains beyond.

Because of the fresh sea winds the climate of San Francisco is equable and healthful. There is but little difference in the average temperature between winter and summer, that of winter being 51 degrees and of summer 59 degrees Fahrenheit.

Because of the water upon three sides, the city cannot grow in those directions and so must expand toward the south. The excellent suburban railways now permit people to work in the city and yet have their homes in the beautiful region along the foot of the Santa Cruz Mountains, a region of which San Mateo is the center.

Golden Gate Park is one of the largest and most attractive in our country. It has an interesting museum and zoological garden. On the south of the park are the buildings of the Affiliated Colleges with a valuable museum of ethnology. On the north of the park are the extensive grounds of the Presidio overlooking the Golden Gate.

On the west is the ocean and Seal Rocks, Sutro Park and Baths, and a fine stretch of sandy beach to which crowds of people resort on warm days.

At the western end of the former grounds of the Panama Pacific Exposition is situated the Palace of Fine Arts. This building, with its magnificent colonnade and rotunda in front, is one of the finest architectural monuments in the United States.

San Francisco is interesting also for the many races of people which it contains and especially for its Chinese quarter.

The rebuilding of the city after the earthquake and fire of 1906.

Few cities in the world have suffered such destruction from earthquake and fire as did San Francisco in 1906. Since that time the city has risen again in a manner almost as wonderful as that of the days of "49." Miles of magnificent buildings have taken the place of those destroyed. They have been strongly built and there is little danger to be feared from future earthquakes and fires. A group of the finest of the new buildings, including the city hall, library and civic auditorium, have been built about the new Civic Center.

What are the most important industries of San Francisco?

San Francisco early became an important center for the manufacture of mining machinery because large quantities were needed in the region which was tributary to it.

As we might expect, shipbuilding has been carried on extensively because of the great demand for boats and the abundance of suitable timber in the forests of the coast. The Union Iron Works has built many of the battleships and cruisers for the United States Navy.

Because San Francisco is advantageously situated for shipping goods in every direction. many manufactories have sprung up. One of the largest canning factories in the world is found here.

Although the bay region has already become a very important manufacturing center, the future greatness of San Francisco will be based mainly upon commerce, which will some day rival in importance that of the city of New York.

The cities of the Contra Costa shore.

In 1850, after San Francisco had become an important place, attention was directed toward the Contra Costa shore, where an old Spanish soldier by the name of Peralta had a grant of land of many thousands of acres.

The water of the Contra Costa shore is so shallow that large ships cannot approach it, but have to be accommodated by very long wharves. There is, however, at one place an estuary extending some distance into the land in which the water was in the early days deep enough for ships of modeate size. Back of the estuary there was a broad expanse of gently sloping land, reaching to the hills, which was covered with a picturesque grove of oaks. This was believed to be a good situation for a town and because of the oaks the new place was called **Oakland.**

Oakland did not become a place of importance until after the building of the railroads. Then the need of a good harbor was felt and the creek or estuary was deepened until it could accommodate vessels of large size. Oakland harbor has now become important and is lined with shipping and manufactories.

At the head of the estuary, in the edge of the hills, is a body of water open to the tide and known as Lake Merritt. This has been made the center of a beautiful park.

One of the most striking and attractive buildings in all the West is the new city hall of Oakland, which towers above everything else and can be seen for many miles.

On the opposite side of the estuary from Oakland is the city of **Alameda,** situated upon what is now an island because of the cutting of a canal across the neck of the peninsula. Alameda is distinguished as a city of homes.

Berkeley lies north of Oakland and directly opposite the Golden Gate. It extends from the bay across a gently sloping plain and part way up the Contra Costa hills. The city has grown up

The Civic Center, San Francisco. Library on left, about the State University, which has now become one of the largest in the United States.

The situation of Berkeley was, then, determined by the University, and the University was located here because of the beautiful oak-covered slope at the mouth of Strawberry Cañon, which faces directly across the bay toward the Golden Gate and Mt. Tamalpais. The most striking monuments upon the University grounds are the great Campanile with its chime of bells, and the Greek Theatre. Because of their pleasant situation and mild climate, Alameda, Oakland and Berkeley all became noted early in their history as cities of homes. The attractions of this region along the foot of the Contra Costa Hills and the convenient local trains and ferries have led thousands of people who do business in San Francisco to make their homes on the east side of the bay.

The youngest city about the bay is Richmond, which is situated north of Berkeley near Point Richmond. A city has grown up here because of deep water near by and the coming of the Santa Fe Railroad. It is becoming an important manufacturing place.

What has made it possible for the region about San Francisco Bay to become the most important manufacturing center in the West?

We have already learned what important advantages San Francisco Bay offers for trade and commerce. For a city or region to become noted for its manufactures it must first of all be easily accessible so that raw material can be shipped to it cheaply and the finished products sent away to market. It must also have cheap and abundant power for running machinery.

The fact that there is very little coal in California, and the long distance that materials had to be brought, delayed the early growth of manufacturing, but now all has changed.

Civic Auditorium in middle, and City Hall at right.

The opening of the Panama Canal now enables us to bring materials from the East and Europe cheaply and quickly.

We no longer need to depend upon coal for fuel, for crude oil, which is cheaper and suitable for nearly every purpose for which coal is used, is now brought hundreds of miles from the oil fields and delivered upon the bay shore.

In order to use water power for running mills, it was once necessary to place the mills by the streams. This would have been very inconvenient in California, for most of the streams that furnish power are far away in the mountains.

Now the unlimited power in the far-away cañons is turned into electric energy and carried in copper cables to the points where it is convenient to use it. Electricity from the mountains runs thousands of street cars in the cities about the bay, furnishes lights in our homes, and does much other work.

SUMMARY.

The Coast Ranges have had an important influence upon the discovery, settlement and growth of Central California.

The direction of the mountains and valleys had made travel up and down the coast easy, but in most places difficult from the coast toward the interior.

The level of the land has always been changing. At one time it was higher, at another time lower, than it is now.

The present position of the land has resulted in only one deep

Oakland business center from Lake Merritt.

land-locked bay and harbor suited to foreign commerce, and that one is San Francisco, situated where the Sacramento River has broken through the mountains.

Because of the absence of other good harbors with openings into the interior, population, trade and manufacturing have centered about the bay region.

The climate, while generally agreeable, varies greatly. In the northwest it is very wet. In the southeast it is very dry, partly because there are fewer severe storms and partly because the high mountains near the coast cut off the moist winds.

The various kinds of climate and the extent of the fertile lands suited to cultivation have determined the settlement and development as well as the sort of industries carried on in the Coast Range region.

On the coast dairying is the most important. Next comes a broad belt in which fruit growing is the most important industry and where the most people are found. Still farther toward the interior grain largely replaces fruit. In those valleys where it is very dry, as well as upon the mountain slopes too steep for farming, stock raising is the leading business.

The situation of San Francisco has natural advantages which have made it the chief commercial and manufacturing city in California.

The valleys which extend back from San Francisco Bay have a delightful climate and with their many advantages have become thickly settled.

Shipping on Oakland water front.

REVIEW EXERCISES.

Why was the exploration of the Coast Ranges difficult from the ocean and easy from the land?
What things lead us to believe the level of the land has changed?
How is produce shipped from the rocky north coast?
How do men often make harbors where Nature has made none?
Why do the mountain ranges near the coast affect the climate of the interior?
In what part of the Coast Ranges are the most valleys?
In what part are the fewest?
Tell where the most important forests are, and why.
What are the most important trees?
Explain how the climate affects the industries in different parts.
Why is the interior of the North Coast Ranges thinly settled?
Why are there few people in the interior of the Southern Coast Ranges?
By what routes can one reach Eureka? What are the leading industries in the vicinity?
Trace the route of the Camino Real and tell what towns are situated on it.
Tell what you can about mineral springs.
What was the important occupation in the early days? Why is farming so different today?
Describe the two most important mineral substances found in the Coast Ranges.
Why did not towns grow up about all the missions?
How do we know that the land has been sinking recently about San Francisco Bay? Where was the mouth of the Sacramento River before the land sank?
Explain how the climate of San Francisco differs from that of the valleys about the bay. What is the cause of the cool winds on the bay in summer?
Explain the importance of the Strait of Carquinez.
Why did not the Russians maintain their settlement in California?
What are the advantages and what the disadvantages of the position of San Francisco? Why did the greatest city of the bay region grow up here?
Why did not Monterey early become a great city?
What are the advantages of water transportation? What are the advantages of the situation of Petaluma and Napa?
Tell how tidal marshes are formed. How do they finally become dry land?
Mention some of the important food fishes and tell where each is caught.
What determined the site of Oakland; of Berkeley; of Richmond?
How are buildings constructed in San Francisco to make them proof against earthquakes?
Where does San Francisco obtain its fuel and electric power?
How do the needs of the cities about the bay affect agriculture in the surrounding valleys?

What are the advantages of the region south of San Francisco for suburban homes? What are the advantages of the Contra Costa shore?

PRACTICAL LESSONS.

The sort of coast line which a country has exerts a great influence upon its settlement and development.

A sunken land has usually many good harbors.

Mountains extending along a coast break the ocean winds, making the interior drier and hotter than if the mountains were absent.

The climate of a country determines the sort of farming carried on in it.

Cities grow up where there are opportunities for trade and manufacture.

The needs of a great city determine the leading farming industries in the vicinity.

The Campanile on the University grounds
at Berkeley.

CHAPTER VI.

The Sierra Nevada Mountains: The Last Barrier Which the Gold Seekers Had to Cross: A Region of Such Vast Importance to California that Without it the State Could Never Have Become What It Is.

Introduction.

The Sierra Nevada forms the greatest mountain range in the United States. It is nearly 400 miles long with an average width of 60 miles. It has many peaks over 14,000 feet high, and Mt. Whitney, the highest in our country outside of Alaska, rises to 14,502 feet.

The range has a long, gentle westward slope, so that all the large rivers flow toward the sea. The eastern slope is very abrupt and the streams descend rapidly to the desert valleys of the Great Basin.

Nearly all the rivers flow through deep cañons and the only large valleys are near the northern end of the range.

The Sierras are noted for their gold deposits, for the wonderful forests and for their grand scenery.

How Fremont found that there was a lofty mountain range between the Great Central Valley of California and the deserts of the interior.

We call General Fremont "The Pathfinder" because he made so many discoveries in the West. Because of an incorrect map he nearly lost his life while exploring what is now Nevada. The map which he had showed a river rising in the Rocky Mountains and flowing westward into San Francisco Bay. Thinking it would be easy to follow down the river and spend the winter in the pleasant valleys of California, he set out with his party to search for it.

For weeks they hunted in vain and at last gave up when they found a range of snow-covered mountains extending across the place where the river was supposed to be. After a long struggle over the snowy summits of these mountains, and when nearly dead from starvation and cold, they succeeded in reaching the green fields of the Sacramento Valley.

How different the story of our state would have been if the river that appeared upon the map Fremont used had really existed. There would then have been no Carson Desert to cross. The Donner party would not have been caught in the snows, and the Death Valley expedition would have kept the main Salt Lake trail, for they would have had no lofty snow-covered Sierras to fear. The Central Pacific Railroad would have had an easy route to Sacramento and would have escaped the long grades and the many miles of snow sheds over the summit.

Could the emigrants seeking the gold fields have escaped the Sierras by going around them?

Now let us see if the emigrants coming by the main overland trail could have reached the Sacramento Valley by any easier route than that over Donner Pass.

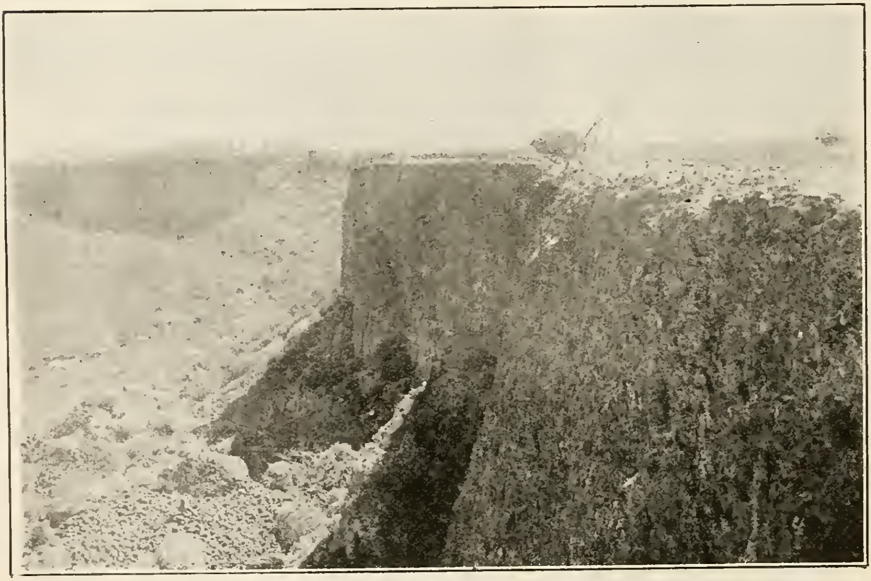
As they approached California the wall of snowy mountains rose directly across their path and extended to the north and south as far as they could see. This was the last and most serious obstacle on the whole journey from the Mississippi Valley to the Land of Promise.

If the emigrants had turned northward they would have found another gap in the mountains called Beckwith Pass. This is less snowy, for it is only 5000 feet high, while Donner Pass is 7000 feet, but their wagons could not have been taken over the rugged mountains between the pass and the valley, nor through the cañon of Feather River. The Western Pacific Railroad, which makes use of both the pass and the cañon, found the latter very difficult to build through.

If the emigrants had turned toward the south they would have found the Carson and Sonora Passes higher and more snowy, while beyond them the Sierras increased in ruggedness and height for 300 miles.

At last, near the southern end of the Sierras, the hearts of the travelers would have been gladdened by the sight of Walker Pass, a low gap in the crest leading across to the South Fork of the Kern River. The rugged cañon of the river would, however, have stopped them just as did Feather River Cañon far to the north.

Continuing their search they would have reached the Mohave



Tuolumne Table Mountain (lava) under which the miners found the gold-bearing gravel of an ancient river.

Desert where the Sierras bend toward the west and join the Coast Ranges. Traveling across its sandy wastes they would have come at last to the Tehachapi and Tejon Passes, through which they could without much difficulty reach the San Joaquin Valley.

After all this search for an easy and direct way over the mountains, do you not think that the emigrants selected the best way when they chose Donner Pass?

By what simple means did the early miners get their gold?

The discovery of gold was an accident. Marshall, while building a mill race in Eldorado County, saw the shining grains in the sands of the ditch. Gold was found later in nearly all the creeks and rivers flowing through the foothills of the Sierras. The miners soon learned that as this metal is much heavier than the gravel they must look for the shining yellow grains on the "bedrock" at the bottom of the gravel.

The only tools needed were a pick, shovel and "rocker." The gravel was shoveled into the rocker and, while the latter was moved back and forth with a motion like that of a cradle, water was poured in. In this way the lighter materials were washed away and the gold was left upon the bottom.

If the miner had some quicksilver and boards he made some "sluice boxes," nailed strips across the bottom and between them put a little quicksilver.

Then he turned a stream of water through the boxes and shoveled in the gravel. The quicksilver seizes and holds the particles of gold as they are being washed through. This process is called **"placer mining."**

After placer mining had been carried on for some time and the richest gravels had been dug over, the miners began to search for the original home of the gold. They soon traced it to a hard, whitish mineral called **quartz,** which forms **veins** extending through the rocks.

As the rocks crumbled away and left the quartz exposed on the surface, it also broke up and, together with the rock fragments, was washed down the slopes into the streams. Nature had in this way been collecting the placer gold through many thousands of years.

There was one vein in particular which drew attention because of its size and length and this came to be known as the "Mother Lode." The vein can be traced for more than 100 miles and has scores of mines located on it.

You can readily see that quartz mining is much more difficult than placer mining. Shafts are sunk in the veins or ledges, and in this way they are followed far down into the earth. Some of the mines on the Mother Lode are more than 3000 feet deep. Where the veins are found upon the sides of steep hills, tunnels are run and the ore is taken out in small cars instead of being hoisted up a shaft by a cable.

In order to separate the gold the quartz is crushed with heavy stamps, after which the yellow grains are collected by the aid of quicksilver on copper plates. When the gold is found in other minerals, such as **iron pyrite**, the ore is usually roasted in a furnace.

The large quartz mines employ hundreds of men. Some of these men mine the ore, others tend the machinery which raises it to the surface, or the mill which crushes it, or prepare the timbers of which large numbers are needed to keep the openings from caving. Miners, engineers, electricians, chemists, carpenters, woodchoppers, teamsters, cooks and store-keepers are needed. These men and their families sometimes form a whole town.

How did the miners get the placer gold that was too deep for pick and shovel?

In many parts of the Gold Belt beds of gravel were found which were often as much as 100 feet in thickness. They were left by great rivers which flowed there long ago. The gold at the bottom of these could not be obtained with a pick and shovel and so another method was tried.

Water was taken out of the rivers by means of ditches far back in the mountains and carried around the hills on a gentle slope until a point was reached above the mine to be worked. From there it was taken down in an iron pipe at the end of which was a "giant" with a nozzle. The water was thus directed against the bank with such terrific force that it was rapidly washed down. The water carried the boulders, gravel and sand through sluice boxes where the gold was collected. This process is known as **Hydraulic Mining.**

As a result of hydraulic mining so much debris was washed into the streams that they were choked. They overflowed their banks, washing gravel and sand over thousands of acres of cultivated lands. So much silt reached the Sacramento River that it also began to

A desert valley in the southern Sierra Nevada Mountains; near Walker Pass.

grow shallower and navigation was made difficult. A law was finally passed prohibiting washing the debris into navigable streams.

What valuable minerals besides gold are found in the Sierras?

Gold has always been the most important mineral product of the Sierras. The silver mines which lie upon the eastern slope are next in importance, and after the silver mines come those of copper.

The granite used in the cities of Central California comes from Rocklyn and Raymond. Beautiful marble is found at Sonora and quarries of roofing slate have been opened near Placerville.

What determined the situation of the cities and towns of the early mining days?

The situation of the towns of the early mining days were not determined by opportunities for trade or manufacturing, as is usually the case; nor was it because there were rich farming lands near-by.

Wherever rich "bars" or "diggings" were found, there the miners rushed by the thousands and towns sprang up in a day. A town might be started upon a steep hillside or in the bottom of a narrow gulch.

Towns which for a time were all bustle and excitement and contained thousands of people, disappeared almost as quickly as they had sprung up. Wherever valuable quartz veins were found, there some of the miners remained and went to work upon them.

All through the mining belt are towns which have only a small proportion of the inhabitants which they had in the early days. Mariposa, Sonora, Angels Camp, San Andreas, Placerville, Grass Valley, Nevada City and Downieville are among the most important of the mining towns which still remain. They are supported now largely by farming, and being situated in a region of many attractive and fertile valleys will some time again become important places.

Sierra Valley, the largest of the valleys in the northern Sierras.

What effect did the rush for gold have upon other occupations?

As long as plenty of gold could be had for the digging, we must not be surprised that few people could be found to do any other work. Provisions of all kinds were very high because they had to be brought such long distances, and often on pack animals over rough mountain trails.

As soon as the best diggings were worked out, many of the miners returned to their homes in the East. Others who had not succeeded in finding the riches they wished turned to farming and often made more money.

Has mining been a good or a bad thing for the development of the foothill region?

We may say that while mining made California a great and prosperous state in a very short time, yet it left the gold regions poor and thinly peopled. None of those who flocked to the mines expected to make their homes there and so did not attempt permanent improvements.

When miners began to leave by the thousands, business of all kinds suffered. The merchant could not sell his goods. The farmer could find few to take his produce. Although the quartz mines finally came to employ a good many men, their number was small compared with those who had been there.

The towns became almost empty, the cultivated fields were turned into pastures, and the country took on a deserted look. Many thousands of acres of the best land along the streams had been destroyed in the search for gold and the barren rock piles added to the desolate appearance of the country. Even now dredgers are at work in the streams where they enter the Sacramento Valley turning upside down the fertile bottom lands. We need the minerals which the miner digs from the earth, but the appearance of the country in a mining district is never as fair and pleasant to look upon as that of a farming district. The miner's work is not permanent. His success does not depend upon the preservation of Nature's gifts, but upon how quickly and cheaply he can get hold of her store. The work of the lumberman is similar, for he leaves the country desolate.

The success of the farmer, on the contrary, depends upon the care which he takes of the trees, the water and the soil. He goes to a country hoping to make his permanent home there and so does everything he can to make his surroundings comfortable and attractive.

What influence has lumbering upon the development of the Sierra region?

Mining, lumbering, farming and stock raising are the four important industries of the Sierras.

Lumbering, like mining, often produces great wealth. Like mining, also, it often leaves a country poor and backward.

Schluter

No forests in the world are more valuable than those of the Sierras and we should manage them with great care that they may always remain to help hold the water from running away and to furnish fuel and lumber.

Parts of the forest are now being lumbered, but often without giving the necessary protection to the young trees. Other parts are in the National Forest and will be lumbered carefully.

If lumbering is carried on properly by cutting only the mature trees, the industry will benefit this mountain region and be a permanent one.

The mills are usually situated in the mountains near where the trees are being cut. The sawed lumber is in most cases sent down

The wonderful Kings River Cañon.

to the railroads in V-shaped flumes. This is because but few railroads extend into the mountains and the rivers are too rocky and swift for the logs to be floated down.

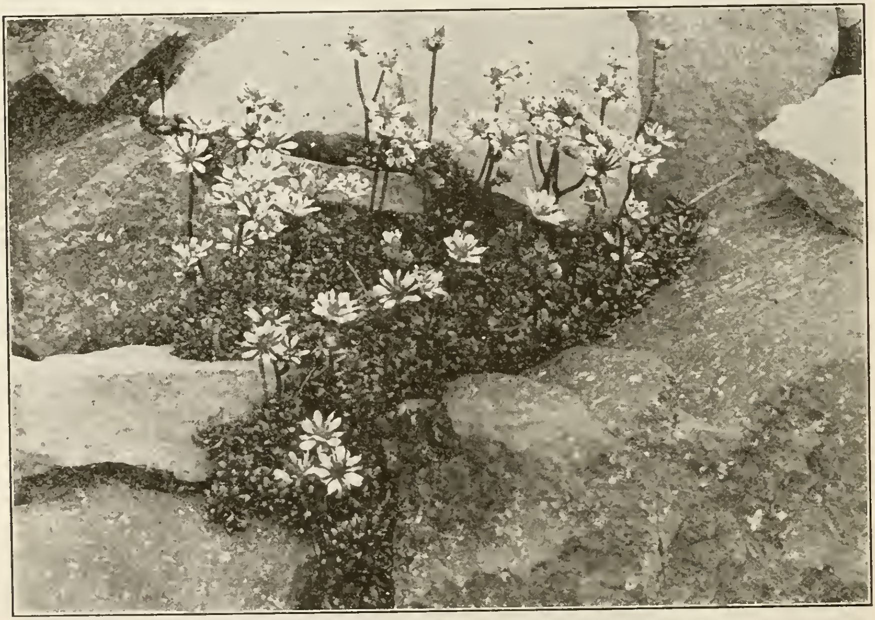
Although the foothill region is backward in its development, it has been favored by Nature above most other regions.

The beautiful foothills, once filled with miners, are now thinly populated and backward. Sometime they will again become one of the most prosperous parts of California.

The foothill region is nearly 400 miles long and from fifteen to thirty miles wide. It contains most of the population of the Sierra Nevada province. Much of the surface is rough, but there are innumerable little valleys where almost everything that is produced in California will grow.

In the lower foothills oranges, lemons, olives, figs, raisin grapes, peaches, pears and prunes thrive. The apples, pears and prunes grown in the upper foothills cannot be excelled by any in our country, although there are as yet few orchards of any size.

The upper foothills have a heavier rainfall than the Great Valley, an abundance of wood and water and a climate as agreeable as any in the world. When good roads have been built and the slow mule team has been replaced by railroads or trucks, produce can be sent to market and orchards will take the place of uncultivated fields.



Arctic flowers (asters) that blossom among the rocks on the bleak mountains above timber line.

Why is it so difficult to cross the Sierra Nevada Mountains?

The Sierras are difficult to cross because we cannot make use of the rivers, because there are no low gaps or passes and because heavy snows block the roads over the summit for fully six months in the year.

Since the mountains are so rough, how did the emigrants get across with their wagons before there were any good roads? The highlands between the cañons have somewhat the character of a plateau, and although they are very rocky it is possible to take wagons over them in some places.

If all the slopes had been found to be steep, and to meet in sharp crests like those of the San Gabriel Range which overlooks the valleys of Southern California, the emigrants would have had to leave their wagons and cross on foot or on horseback.

Why is it that the rivers flow in deep, rocky cañons?

Long ago the Sierra Nevadas were not so high as they are now and the rivers flowed quietly through broad valleys. Then there came earthquakes and the mountains were shaken and lifted until the slopes became much steeper. The water then began to run swiftly and to grind away the rocks over which it flowed.

After hundreds of thousands of years the rivers have cut such deep channels that they are almost buried from sight. Back of these channels or cañons, which are very precipitous, much of the old gently sloping surface remains, and it is this which we have called the **plateau-like upland,** and which, as we shall see, is of very great importance.

In the Mariposa Grove of Big Trees.

In what way is the plateau-like upland of so great importance?

The cañons of the Sierras are so rocky and narrow that few people live in them. If all the slopes were as steep as the sides of the cañons there could have been no heavy forests nor any land that the farmer could cultivate. Mining would be the only industry that could be carried on.

Much of the plateau-like upland is indeed very rough and many peaks rise from it toward the summit of the range, but it contains innumerable valleys with gentle slopes and rich soil.

Upon these gentle slopes grow the wonderful forests for which the Sierra Nevadas are so noted. The higher valleys are too cold for farming, but lower down, toward the foothills, they offer every attraction. Here the climate is warm, but not too warm, the scenery pleasing, the water pure and cool, while the soil, temperature and rainfalls are suited to the growing of a great variety of fruits.

Can people make homes in all the highland valleys of the Sierras?

Although it is so hot in the Great Valley in the summer, we find, if we ascend the mountains far enough, a region where it freezes almost every night and the snow falls twelve to fifteen feet deep in the winter.

This lofty region is, then, not suited to home making, but is a delightful place in which to spend the summer. Most of this region is included in the National Forest which the Government is taking care of, partly to see that it is not wasted by fire or by the careless cutting of lumbermen, and partly to protect the water supply.

How do the summer thunder storms serve the farmers in the lower valleys?

On many hot summer days lofty masses of thunder clouds gather over the high Sierras. They grow dark and flashes of lightning are seen, while here and there fall heavy showers.

These summer storms are due to the cold mountain tops which turn the invisible moisture in the air, as it floats across them, into clouds and rain. These storms may be so severe as to cause the rivers to rise, thus furnishing the farmers in the distant valleys more water for irrigation.

Why is it that the Western Slope has such heavy forests, while the Eastern descends to a region of deserts?

The storms come from the Pacific Ocean, as we have already learned, causing heavy snow and rain along the summit and over the western slope. By the time the storms have passed the cool summits of these lofty mountains, they have lost so much of their moisture that their force quickly decreases, and in the course of a few miles rain almost ceases to fall.

On the western slope of the Sierras there is a wide belt which has a climate intermediate between the dry, hot lowlands and the cold, snowy summits. Here the conditions favor the growth of forests of immense cone-bearing trees.

What differences do we observe in the climate, productions and industries at different elevations of the slope of the Sierras?

1. **The lower foothill or sub-tropical belt:** This region lying along the border of the Great Valley is covered with a scattering growth of oaks. Here are orchards of oranges, lemons, olives and figs which require a hot climate. Other fruits, such as pears, peaches, apricots and grapes, flourish in this region.

2. **The upper foothill belt:** Here the climate is a little cooler and more rain falls. Digger pines in addition to oaks are found in the lower part, while in the upper part we are in the edge of the yellow pine forest. The cooler climate is suited to the growing of peaches, pears, cherries and apples. Stock raising through all the foothills is an important industry because much of the land is too rough for cultivation.

3. **The great forest belt:** In this region, at an elevation ranging from 4000 to 7000 feet, are the finest coniferous forests in the world. The yellow pine is the most important lumber tree in the lower part. Cedar abounds here also and is used for rails and posts. The tree of least value is the white fir, while that of most worth is the sugar pine, which is used for doors, window sash, shelves and other purposes requiring a fine grained wood.

The noted Sequoias or "Big Trees" occur in this belt and are scattered along the mountains above 5000 feet. The most noted groves are the Kaweah, Kings River, Fresno, Mariposa and Calaveras. These trees reach a height of 300 feet and a diameter of 30 feet, and some are believed to be 4000 years old. To our shame and sorrow, many of these wonderful trees have been cut down and made into lumber.

Much of this great forest belt is too high for farming, but the many meadows are useful for grazing purposes. Dairying has long been an important industry in the northern Sierras because there the valleys are larger. The cool air and green grass favor the making of the best butter and cheese.

4. **The upper forest belt:** As we go upward, the trees of the region just described disappear, and the red fir, tamarack pine and white pine take their places. These trees do not grow so large because of the increasing cold.

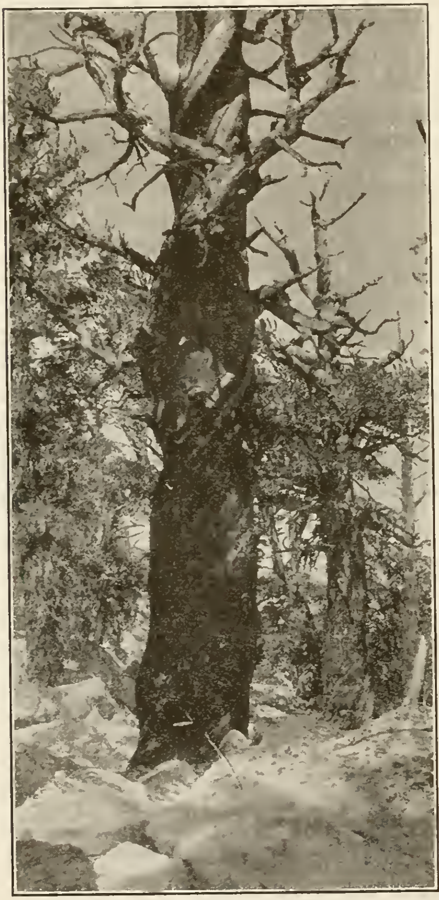
5. **The timber line:** We are now in a region which has an almost arctic climate. The fierce winds and winter cold make the trees gnarled and dwarfed. The struggle for life is a hard one and they cling close to the rocks, sometimes rising not more than two or three feet above the ground.

6. **The arctic region of bare rocks:** We have now reached an elevation of more than two miles above the sea. The climate is too severe for trees or shrubs. Snow lies under the shadow of the

cliffs all summer long. In the sheltered nooks, however, we find beautiful arctic flowers.

Thus we see that in climbing the lofty Sierra Nevada Mountains we pass through all the different climates which we would find in traveling from the tropics to the arctic regions, a distance of several thousand miles.

Why is it that there are so many beautiful lakes in the high Sierras?



This gnarled and twisted Foxtail pine has struggled with the storms for hundreds of years; near timber line on Mt. Whitney.

If we should take a camping trip and travel the whole length of the high Sierras, scarcely a day would pass when we could not see one or more beautiful lakes set among meadows, crags and forests.

Why are there so many lakes in these mountains and so few in other parts of California? If we examine the surface of the rocks about these lakes we shall find the answer to this question. They are polished smooth, while here and there the surface is marked by grooves and scratches.

This work was done by glaciers such as we still find upon some of the higher mountains in our state. Long ago it was colder in the mountains, more snow fell, and it did not melt away rapidly. The snow changed to ice and moved slowly down the mountains. The ice polished the rocks, while the boulders which it carried along scratched and grooved them. Where the rocks were soft they were ground away faster and in this way the rock basins were made.

When the ice of the glaciers at last melted, the water gathered in these basins and formed lakes. Some of the larger lakes do not occupy rock basins, but were made by dams of boulders and gravel which the glaciers left piled across the cañons.

Why do so many people spend the summer about Lake Tahoe?

Tahoe, although more than a mile above the sea, is the largest and deepest of the California lakes. It has become famous as a summer resort because of the pleasant wooded shores, cool, bracing air and rugged mountains surrounding it.

Tahoe is not a glacial lake, but occupies the southern end of a deep hollow almost on the summit of the mountains. In the opposite end of this hollow, far to the north of Truckee, lies Sierra Valley, noted as a cattle and dairy region.

Long ago a flow of molten lava from some volcano made a dam across the ancient valley and this, filling with water, gave us beautiful Lake Tahoe.

Of what important use are the lakes in the high Sierras?

The lakes help to make the flow of the streams more even by storing a part of the water when the snows are melting rapidly. They thus lessen the danger of floods and save the water for summer use in the valleys below.

Lakes serve the same purpose as reservoirs, which we have to build at great expense where there are no lakes, if we wish to save the water of the winter storms for irrigation.

The little streams which feed the lakes are bringing sand and mud and have completely filled many of them. Nature is in this manner making the green mountain meadows which are bright with flowers all summer long.

The cold and storms of timber line do not permit the trees to grow upright but causes them to grow close to the ground.

In how far is the settlement of the Great Valley dependent upon the rivers of the Sierras?

We have learned that the need of the Great Valley is water. The rainfall is so light in the southern part that it must remain sparsely settled unless water is furnished from some other place where there is plenty. It seems as if Nature had made the lofty Sierras on purpose to furnish the needed water.

The Sierras tower so high and cover so many thousand square miles that they take vast quantities of water from the clouds. The rivers collect this and pour their mighty floods down through the cañons, bringing this life-giving substance to the very doors of the valley farmers.

The rivers of the Sierras have another important work, and that is supplying power to run machinery. Much of this power would go to waste if it were not that we can turn it into electricity and carry it in copper wires for 200 or more miles. The rivers, then, furnish power for doing all kinds of work in the foothills as well as in the Great Valley, Southern California and the coast region.

Since the value of the water furnished by the High Sierras is so great, should we not be very careful that nothing is done in this region which will lessen the supply?

Wherever we go in a hilly or mountainous region we see little gullies made by running water. They appear by the roadside, in the plowed fields and pastures. When we cut down the trees and bushes, when we pasture the slopes too closely, and when we do not use care in plowing, we leave the surface of the ground in such condition that the water not only runs off more rapidly, but it collects in rivulets which cut channels and carry away the soil.

The effect of cutting the trees and pasturing the slopes of the mountains is even worse than it is in the lower valley slopes where people live, for the storms are much more severe at high altitudes and the slopes are steeper. The result is to cause higher water in the spring and less water in the summer.

We should not pasture the high Sierras; we should not cut down the trees or disturb the surface in any way, for Nature will surely exact a penalty. She has clothed the mountains with vegetation so that erosion was slow until men came to disturb her arrangements.

The mountain slopes in Spain, Italy, Palestine, China and Corea are washed and gullied by the rains because they were not cared for. Their rivers are low in summer, while in winter the people have to work hard to keep the sand and gravel which washes down from the mountains from burying the rich soil of their valleys.

For what are the Sierra Nevadas noted all over the world?

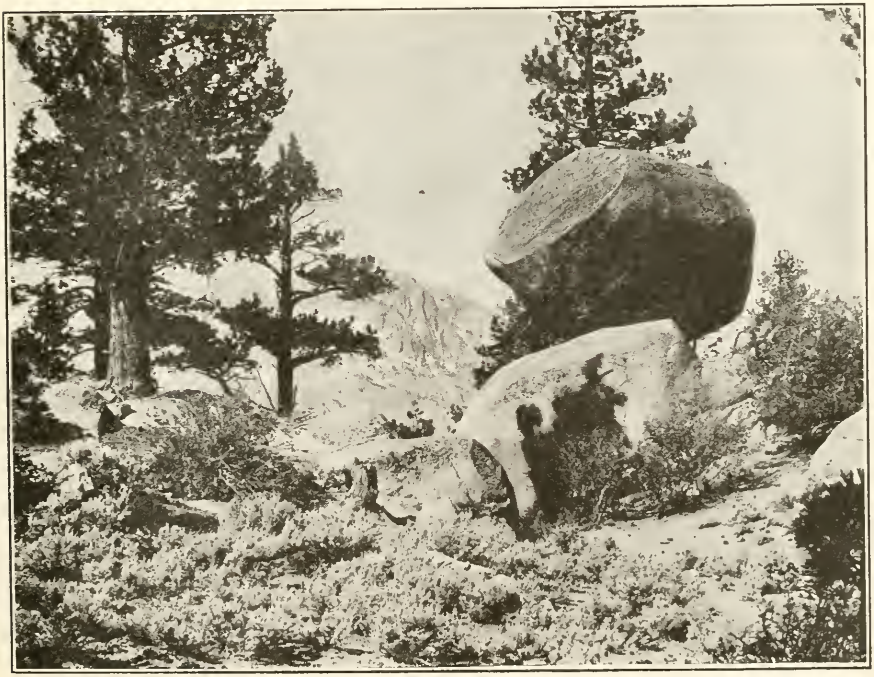
When the Sierra Nevadas are mentioned, we may think of the excitement at the discovery of gold; we may think of the hardships and dangers which the pioneers went through in crossing this lofty region; we may think of the dashing rivers so important to the farmer, or we may think of the wonderful forests and grand scenery. The two things, however, which make the Sierras now most widely known are the Yosemite Valley and the Big Trees.

The Yosemite is the most wonderful valley in the world. It is set deep in the mountains and surrounded by almost vertical cliffs of granite which rise from 2000 to nearly 4000 feet. The Merced River, which comes tumbling down from the high mountains, enters the valley by two great waterfalls, and after flowing for eight miles through meadows and scattered forests, goes on down through its cañon to the Great Valley to furnish water for the farmers. On the north side of the valley are the Yosemite Falls—the loftiest in the world—and on the south side is the beautiful Bridal Veil Fall.

For thousands of years the river has been at work cutting this valley out of the solid granite. At times the water was aided by the glaciers which once partly filled the valley with ice. When the last glacier melted it left a lake which the river has now turned into a green meadow.

The cañons of the Tuolumne, Kings and Kern Rivers are also noted for their grand and picturesque scenery. They are visited by many camping parties, but can be reached only by means of rough mountain trails.

A few miles north of the Yosemite is Hetch Hetchy, another



A perched boulder left by one of the ancient glaciers of the Sierras.

mountain valley, with lofty cliffs and waterfalls. It is proposed to turn this valley into a lake by building a dam across the cañon below and to carry the water to San Francisco.

What is the object of the national parks in the Sierra Nevadas?

We wish to preserve for all time the most attractive parts of our mountains as public playgrounds. We wish our children to see and enjoy the mighty trees, the cliffs and waterfalls just as they appeared in their natural state when white people first saw them.

The Yosemite is the largest of the National parks in California, and includes the mountains for many miles on every side of the valley. Besides this park there are the Sequoia, General Grant and Mt. Whitney Parks, which include some of the grandest scenery and most important groves of Big Trees.

Every one is free to camp in the parks and enjoy all that Nature has to offer, but one must obey the rules. All guns must be left behind and great care must be taken about fire. No injury must be done the trees, plants, wild animals or birds.

In what way do the national forests differ from the parks?

The lands of the National Forests belong to the Government just as do the parks and are used also as camp and playgrounds. It is not the plan to prohibit entirely the cutting of timber, but to supervise the cutting so that the forests will be preserved, and not destroyed selfishly, as they usually are when controlled by lumber companies.

The Pinnacles, on the crest of the high Sierras. Near the head of Kings River.

The men who take care of the forests are called Forest Rangers. They patrol the woods in summer to watch for fires, for these cause almost as much destruction as the careless lumbermen. It is also the business of the ranger to determine what trees are ripe and ready to be cut for lumber and to see that this is done without injury to the young trees.

Cattle and sheep are allowed to be pastured in the forest by the payment of a small rental. The ranger sees that only a certain number are allowed in a given area so as not to have the surface injured in a way to cause erosion and loss of water. Before the establishment of the National Forests sheep did enormous damage upon the higher mountain slopes, destroying the meadows, killing the young trees and causing the water to run off faster. We should do all we can to help the forest ranger in his work, for he is guarding the natural resources of our country for our benefit.

The Sierra Nevadas form the largest and most attractive camp ground in all the world.

If we loved our mountains as much as the people of Europe do the Alps, we would all wish to spend our vacations among them. In the Alps no one can live entirely out of doors, for it is wet and stormy, but in our mountains there are no summer rains except the occasional thunder storms, and life in the open air is most delightful.

If we could all spend a few weeks each summer among the mountains, we would be stronger and happier and better able to study and work the rest of the year.

Hetch Hetchy Valley, where San Francisco is building its great reservoir.

SUMMARY.

The Sierra Nevada Range formed a serious barrier to emigration from the East, but had to be crossed, as it was difficult to reach the gold fields by any other land route.

The Sierra Nevada is the longest, broadest and highest mountain range in California. Here we find the most extensive forest area and the largest trees. Here are nearly all the lakes, and the rivers afford more water for irrigation and more power for electricity than all the other rivers of the state.

The first gold fields were worked in the foothills, where many towns sprang up. Placer mining lasted but a few years, giving place to hydraulic mining and quartz mining. Many of the miners have left these little foothill towns, so that the population is less today than fifty years ago.

The backward condition of the foothill region, in which most of the population is found, will not last. The quartz veins still produce millions of dollars in gold every year, while the valleys are rich in agricultural resources. Some time the region will again be thickly peopled and prosperous, but this prosperity will be permanent, for it will be based on agriculture.

The scenery of the lofty peaks, deep cañons and valleys has made the Sierra Nevada Mountains renowned throughout the world. Its attractions as a summer playground draw a greater number of people every year.

REVIEW EXERCISES.

Of what great importance are the Sierra Nevada Mountains to California?
Why were the Sierras so difficult to cross in the early days? Why are they still difficult to cross?
Tell what you can about the advantages offered by the passes. What passes are now used by the railroads?
Why was it easier for the emigrants to follow the ridges than to keep along the streams?
How did the placer gold become buried in the stream gravels?
Describe the different ways of getting the gold.
What determined the position of the mining towns of the Sierras?
Find out what you can about life in the mining camps in the early days.
What happened when the placer mines began to give out?
Why do miners and lumbermen take less pains with their homes than do farmers?
Which offers the surest means of a comfortable home, mining or farming?
Why are the foothills of the Sierra Nevada Mountains now so thinly inhabited?
What advantages do the foothills offer for permanent homes?
In what part of the Sierras do we find the great forests? Why do

they occupy a belt instead of covering all the western slope?

Describe the changing vegetation as one goes from the foothills to the summit.

Why in lumbering are the logs usually sawed in the mountains instead of being taken to the Great Valley? How is the lumber carried to the valley?

What is the effect upon the water supply of clearing the forests from the mountain slopes? What is the effect upon the soil?

Why should we be particularly careful of the forests of the Sierra Nevadas?

Explain how the lakes help protect against floods. Of what other use are the lakes of the Sierras?

In what way may pasturing the mountain slopes injure the water supply?

Tell what you can about the Yosemite Valley.

What was the purpose of the Government in establishing the National Parks?

How is the government helping to save the timber for future use?

Tell what you can about the important lumber trees of the Sierras.

Why should we be very careful about setting fires in the mountains?

What injury do fires cause besides that of the loss of timber?

What are the advantages of the Sierras as a summer camp ground?

PRACTICAL LESSONS.

Mountains and deserts were once serious barriers to the spread of people across our continent. Now we carry water into the deserts and make tunnels through the mountains.

Settlements and industries of most mining and lumbering regions are less permanent than those in regions were farming is the chief industry.

Mountains which have plateau-like uplands are of much greater value than those with sharp-edged ridges.

In going up a high mountain one passes through many different climates.

Lakes are numerous in all regions where there have been glaciers.

It is of the greatest importance for the development of California that we do not cut off the timber or injure the surface of the high mountains:

It is necessary for our health and progress that we have large tracts of mountain country set aside for permanent summer playgrounds.

CHAPTER VII.

Southern California: A Land Left by Nature Almost a Desert But by Men Turned Into a Garden of Fruits and Flowers—A Land Where Snow-Covered Mountains Look Down Upon Blossoming Orange Groves, Upon Valleys Whose Clear Skies and Balmy Air Have Made Them Renowned Throughout All Our Country.

Introduction.

We have learned how Nature has surrounded California on the land side by mountains and deserts, and how difficult these were to cross before the building of good wagon roads and railroads.

We are now coming to the study of another region which, although it forms one of the most important divisions of our great state, is almost as completely separated from the rest by mountains and deserts as the whole state is from the outside world. Had it not been for a narrow pass close to the ocean, the early explorers might have been unable to make their way northward, and in such a case the story of California would have been different.

Southern California is not a simple region or one easy for us to study. It has many kinds of climate, ranging from that of the high mountains, where the winters are very cold and heavy rains and snows fall, to the Colorado Desert, one of the driest and hottest places in the United States.

Southern California has many kinds of mountains, valleys, soils and minerals, and because of all this its people are engaged in a great variety of occupations. It is less than one-sixth of the area of the state, but contains fully one-third of the population.

What is the nature of the mountains and deserts that inclose Southern California?

The Mohave Desert is a part of the Great Basin, as we shall learn more fully later. It extends so far westward that it almost cuts the state into two parts. What the desert lacked of doing has been completed by the mountains. These lie between it and the ocean, filling all eastern Santa Barbara County. They are so steep and rugged that no wagon road has been made across them.

There is but one open route, then, between Southern and Northern California, and this lies close to the ocean. The traveler who would go direct to the San Joaquin Valley from Southern California finds, blocking his path, two mountain ranges with the Mohave Desert between them. In the early days of our state these were far more difficult to cross than they are now.

The mountains which make difficult the way between Southern and Northern California are a part of a great system of mountains which are fully as important to the people of Southern California as the Sierra Nevadas are to the people of Northern California. Like the Sierras they form a serious obstacle to travel and trade, but are indispensable to the people who live at their base.

The system of mountains of which we are going to speak extends wholly across the state, reaching from the ocean nearly to the Colorado River. Their direction is more nearly east and west than any other of our mountains except the Santa Monica Range.

The different portions of these mountains are known by different names. The western part, extending through southern Santa Barbara County, is called the Santa Ynez Range. Its western end is in the ocean and forms Point Conception, the most prominent cape on the whole coast of California.

Following the mountains eastward we shall not try to remember the names of the many different ranges which we pass until we come to the highest and most important ones. These overlook the Los Angeles - San Bernardino Valley and shut it away from the deserts.

The first of these is the San Gabriel. It is often called the Sierra Madre, meaning "mother mountains." It has very steep slopes and sharp ridges, and San Antonio, the highest peak, rises 10,080 feet. The Spanish explorers rightly called this range Sierra Madre, for it is the oldest of the high mountains of Southern California.

Continuing still farther eastward along the great system of mountains bounding Southern California on the north, we cross the Cajon Pass and come to the San Bernardino Range. We will climb San Gorgonio, the highest peak in Southern California, and from an elevation of 11,485 feet will obtain a wonderful view over a vast extent of country.

To the north rises the sandy wastes of the Mohave Desert, whose bare, rocky mountains look like little hills. To the southeast lies the Colorado Desert, where travelers have died of heat and thirst. The desert has lost its fearsome character and in its very heart there now stretches miles of green fields—a wonderful change brought about through the discovery of artesian wells and the bringing in of the water of the Colorado River. On the west lies the green valley of San Bernardino, and away in the distance we may see, with the aid of a good glass, Los Angeles and the ocean.

To the south of and opposite San Gorgonio lies its twin peak, San Jacinto, which has a height of 10,805 feet. Between them is San Gorgonio Pass, which forms the easiest gateway into Southern California.

From San Jacinto we look over a sea of mountains which extends southward between the Colorado Desert and the ocean. These mountains we shall call the Peninsula Range, for they form the backbone of the peninsula of Southern California.

What can we say of the slopes and river basins of Southern California?

We once thought of Southern California as that land lying on the seaward slope of the mountains which we have just described. That was because this slope contained practically all the inhabitants.

The seaward slope is, like the similar slopes of the Sierra Nevadas and Coast Ranges, much the longer. It receives most of the rainfall and contains the larger rivers.

Now we have come to think of Southern California as including also the eastward or desert slope of the mountains. Because of the bringing in of water from the Colorado River, and the boring of many wells, thousands of people now dwell upon the desert slope.

Because the two main slopes of Southern California are somewhat like the two sides of a roof, there are no very large river basins but many small ones instead.

The largest basins are those of the Santa Ana, Santa Clara and Los Angeles Rivers. These rise in high mountains where the rainfall is heavy, but they flow so far to reach the ocean that in summer their beds, in their lower courses, are dry. Much of the water is lost in the dry air, a part sinks into the sand, and since the settlement of the valleys all that can be obtained is carried away in ditches for irrigation.

If you live in Southern California you should find out all you can about the river that supplies your home district, for that is the most important one to you.

Why do we often call Southern California the land of "Orange Groves"?

It was gold which first made California talked about and this was for a long time its chief product. California became known as the "land of gold." All eyes were turned in the direction of the

—Auto Club of Southern California.

Among the orange orchards of Southern California.

mines which had been opened in the foothills of the Sierra Nevada Mountains. No one thought of stopping in Southern California or dreamed that the half desert slopes would one day be covered with orchards.

Now miles of orange groves, the trees laden with fragrant blossoms and yellow fruit, have taken the place of the desert bushes. Southern California has become one of the most important orange growing districts in the world and is noted as widely for its golden fruit as Northern California once was for its golden sands. For this reason we call Southern California the "land of orange groves."

How was it that the Padres found it so difficult to reach this region?

The Mission Fathers came from Mexico. The journey from the City of Mexico overland to California was far more dangerous than that followed by most of the "gold seekers," and so this possible route was not used.

The usual way to reach California was by ship from some Mexican port, but the boats were small and frequently delayed by storms. Because of the danger of travel by sea, parties sometimes came north through the long and desert peninsula of Lower California, a journey which took many weeks.

How is it that this region, once believed to be almost worthless, has been transformed into a land of fruits and flowers?

Although the valleys of Southern California appeared very dry in summer before they were cultivated, yet their climate is very far from being that of a desert. They receive from twelve to fifteen inches of rain yearly, while upon the mountains there is much more.

The reason that the land appears so desert-like is that the rains fall mostly during the winter months and the long, hot summers, when it is so greatly needed, are without any. Thus the light soil of the valley slopes becomes so dry that it supports a scanty vegetation. Only those plants which have become accustomed to going without water through the long, hot months could live and thrive there under Nature's rule.

Some farm crops that ripen early, such as grain, can be grown with only the moisture of the winter and early spring rains. If we would grow fruits and vegetables with complete success, we must water them artificially. Without a supply of water for summer use, Southern California could never have become a flourishing, thickly settled country.

How was this needed supply obtained? The total rainfall could not of course be changed, but could not a part of this water in some manner be saved for summer use?

What becomes of all the water from the rains and snows on the mountains, and of the springs and little streams which flow all summer in the mountain cañons?

If we follow a stream down from the mountains we shall find that soon after reaching the valley the water disappears in its sandy bed. A part is lost by evaporation in the dry, hot air, but another part sinks between the pebbles and grains of sand and flows on underground across the broad valley to the ocean. So there is water here, but it is underground out of sight. The rivers, we say, flow upside down in the summer time.

Spanish Bayonet and Big Cone Spruce in the San Gabriel Cañon.

After the severe winter rains, muddy floods sweep down the dry channels. Most of this water is lost in the ocean, but a part sinks in the gravels and sands underneath the valleys, where it forms vast stores only waiting to be pumped out.

Thus we see that Nature does supply this region with an abundance of water, but not at the time of the year when it is most needed, and besides she wastes a large part of it.

The discovery of the vast stores of water underground and the learning how to hold and use the winter floods, has enabled us to change this region, apparently so dry and barren, into a garden of fruits and flowers.

Is there any resemblance between Southern and Central California?

Southern California has one large central basin, but this is broken into two parts by a chain of hills. We call the two parts the Los Angeles-San Bernardino Valley. There are no Coast Ranges separating the valley from the ocean and it is drained by three independent rivers. These are, in order of their importance, the Santa Ana, San Gabriel, and Los Angeles.

Three large valleys—the San Fernando, Temecula - Elsinore and San Jacinto—open into the central basin, while many others open directly to the ocean. The most important of the latter valleys are the Santa Clara in the north and the San Luis Rey and San Diego in the south.

Central California, as we have already learned, has one great valley with mountains all around it, is almost unbroken by hills, and is drained by one river which breaks through the Coast Ranges to the ocean.

How is it that oranges ripen later in Southern California than in the Great Central Valley of the north?

The Great Central Valley is so completely shut in by mountains that the cool winds from the ocean reach it only at one point. Thus this region is warmer than it otherwise would be during most of the year.

The cool ocean winds blow inland, carrying fog across the whole of the Los Angeles-San Bernardino Valley, because there are no Coast Ranges to break them. For this reason the air of these southern valleys is cooler than we would expect to find it, and oranges, as well as other fruits, ripen fully a month later than they do in the Great Central Valley, 500 miles farther north.

This is one of the many strange and curious things about our California climate which teaches us that the temperature of a place and the kinds of fruit which are produced in it do not depend upon its distance from the tropics.

What was the first consideration of the early Spaniards when seeking places for their settlements?

There is a reason for every town or settlement being where it is, but these reasons are not always the same. A town may spring up in a given place because of advantages for trade, because of water power for manufacturing, because of rich farming lands about, or because of mines near by.

In Southern California the most important thing which determined the locations of the early towns was **water**. Without water there could be no gardens, and since it was such a long and dangerous journey to any place where supplies could be obtained, it was absolutely necessary to raise what was needed just as soon as possible.

With their poor tools the pioneers could not build elaborate water systems as we do now, so that they were compelled to locate as near as possible to springs or permanent streams. The second thing that the pioneers had in mind when locating their settlements was fertile soil, for without that water would produce but little. The presence of a bay or safe landing place was another thing which determined the location of some of the settlements.

Why did the discovery of gold have so little influence upon the settlement of Southern California?

1. **It was not at first known that gold occurred in Southern California:** Placer gold had been found in the mountains of northern Los Angeles County years before the discovery in the north, but the Padres did not look with favor upon mining and it was soon forgotten.

Those who passed through Southern California on their way to the mines did not stop because the country, in its natural state, did not offer so good inducements to the farmer as did the region of greater rainfall to the north.

2. **The region was remote from the main lines of travel which led to the mines:** Few of the gold seekers came through Southern California, for the main trails crossed the continent farther north. The southern trails were longer and more dangerous, but some people came this way in winter when the northern routes were blocked with snow.

3. **The southern trails led for a much greater distance through a desert country where feed and water were difficult to obtain:** The course of the old Santa Fe Trail was from St. Louis up the Arkansas River and across the southern Rocky Mountains to Santa Fe in New Mexico. From here it led through Southern Arizona with its broad deserts and dangerous Apache Indians to Fort Yuma. Then came the worst stretch of all, the Colorado Desert, which had to be crossed before either Los Angeles or San Diego could be reached.

The other route was known as the Spanish or Mormon Trail, some Mormons having come this way and settled in the Valley of San Bernardino. The course of this trail was south of Great Salt Lake and across Southern Nevada and the Mohave Desert and through the Cajon Pass to the Valley of San Bernardino.

When the emigrants who came by these routes had reached Los Angeles they were still far from the mines. Two mountain ranges and the Mohave Desert still lay in their path and would have to be crossed before they could reach the San Joaquin Valley. From this point the route lay over a vast plain, broken only by the rivers from the Sierra Nevadas. In the spring these rivers were difficult to cross.

Why did agriculture develop more slowly in Southern than Northern California?

1. **Stock raising long remained the most important industry:** Few of the early emigrants stopped in the south and the life of the Spanish inhabitants went on with little change long after the discovery of gold. Much of the land continued to remain in the hands of the original owners, who held large tracts called **"grants,"** so named because granted to them by the Mexican Government.

The wealth of the ranchos consisted largely of cattle, horses and sheep. There was a market for hides and tallow, but for little else. After the miners came there would have been a market for beef, but there were no refrigerators in those days, and it was too far to drive the cattle.

2. **There was no market for produce of any sort:** Until there was a market we could not expect agriculture to become an important industry. The people of the Missions, towns and ranchos all had their own gardens watered by ditches from some near-by stream.

The distance to the gold fields was so great that it was not possible to send fruit and vegetables there. Fruit could have been sent to San Francisco by water, as it was from far more distant countries, but the old orchards no more than sufficed for the home population. The few new farmers from the East were slow in understanding the natural advantages which this region offered for growing fruit.

3. **The country appeared dry and worthless to the emigrants from the Eastern States, who did not understand what could be done with irrigation:** The first settlers who came to this region from Spain and Mexico were used to a dry climate and to the methods of irrigation. They saw quickly the similarity of the climate to that of their old homes and so were able to choose wisely the places for their gardens. They settled near permanent streams, built dams and ditches to carry water to these gardens, and were at once successful in making the land produce abundantly.

The Eastern emigrants knew nothing about irrigation. They were used to summer rains, and this country, which was so dry in the summer, did not attract them. It was a long time before they learned the advantage of being able to water their lands just when water was needed, instead of having to wait for a chance shower.

4. **Water was not easily obtained for irrigation on a large scale:** While there was plenty of water at hand for the gardens of the few Spanish settlers, the problem of obtaining water to irrigate thousands of acres was a much more difficult matter.

Irrigation canal near Riverside.

It was some years after Americans began to settle in Southern California before they discovered that there was really an abundance of water in this region apparently so dry. The thick beds of gravel and sand underlying the valleys proved to be vast reservoirs of water which could be opened by means of wells. In most places the water had to be pumped by means of wind mills or gas engines. In some places it flowed out, forming artesian wells.

The spring floods which came from the heavy rains and melting snows on the mountains showed the people that here was another important supply of water which, if it could be made use of, would be sufficient to irrigate all the valley lands. The flood waters are now being partly held back in reservoirs and are turning the barren slopes into gardens of tropical luxuriance.

5. **The sandy soil with its scanty vegetation was believed to be poor:** Most of the mountains of Southern California are formed of granite which contains, among other things, much quartz. As the rocks crumble, a portion of this material is washed down into the valleys, where it aids in making the soil. This soil is generally light and more or less sandy, and as it supported only a scanty vegetation, it was believed to be poor and unsuited to growing profitable crops. It took the early settlers some time to learn that this soil was really very rich and needed only water to make it produce abundantly.

6. **The mountain slopes are usually too steep and rocky for farming:** The rainfall is so much greater in the mountains than in

Mt. San Jacinto from Hemet Valley.

the valleys that if these high lands were otherwise suitable for farming they would require no irrigation.

The greater part of the mountains of Southern California rise so steeply from the lowlands, and their slopes are so rocky, that it is impossible to farm them. In the Peninsula Range in San Diego County there are, however, many mountain valleys, and a few in other parts of this region where general farming and fruit raising are carried on without irrigation.

What finally led to the rapid settlement of Southern California?

1. **Climate has been the most attractive feature:** Little thought was given to climate or scenery in the early days. Learning how they could best make a living in the new land occupied all the attention of the first settlers.

Finally, as it became known how well adapted Southern California was to the growing of sub-tropical fruits, what a mild and agreeable climate it had, and how picturesque were the surroundings, it began to attract visitors. People who wished to escape the cold winters of the Eastern States went there to spend a part of the year. This led to the building of great hotels to accommodate tourists.

Many of the visitors were captivated by the mild climate and beautiful surroundings, so that they remained and made their homes there. Towns and cities sprang up very rapidly and orange groves began to take the place of the desert bushes.

2. **In what way has the climate proved attractive?** There are three distinct sorts of climate in Southern California: the climate of the coast, of the interior valleys, and of the mountains.

Upon the coast the ocean winds and fogs make summer almost as cool as winter, while changes in temperature between day and night are very small. San Diego has the most even temperature of any place in our country.

In the interior valleys, where the sea breezes do not reach, the summer temperature is very high. Coachella and Imperial Valleys are among the hottest places in the United States. However, the air is so dry in these valleys that it is much less oppressive than it otherwise would be, and sunstroke is rare.

The Los Angeles-San Bernardino Valley extends far inland, but the climate over its whole extent is influenced by the ocean. Although, as we have learned, it is divided into two parts by a chain of hills, yet these hills are not high enough to break the ocean winds and upon many summer mornings the valley is completely buried under a blanket of fog.

Upon the mountains we find a very different climate. The winters are cold and heavy snows fall. The summers are delightful for camping and occasionally heavy thunder storms occur.

3. **The discovery that the soil and climate were suited to growing a great variety of fruits:** The old Mission garden showed what a wealth of sub-tropical fruits could be raised in California, but it was not learned until later that fruits of other climes would grow

equally well in the hot lowland valleys.

In the same garden with the orange, pomelo, lemon, fig, olive and raisin grape, we find the apple, pear, peach and plum, which are natives of a more northern and colder region.

We must not forget, however, that each of the three climatic regions which have been mentioned grows certain fruits better than the others. Lemons do well near the coast, oranges and grapes are best in the hot interior valleys, while apples excel in the high mountain valleys.

4. **The building of the railroads had a great influence upon the growth of Southern California:** In the early days it was useless to set out groves of orange, lemon and olive trees, for there was no market for the fruit. It was not possible to send produce overland by wagon, nor even to Northern California. San Francisco and other coast cities were within reach by water and these were the only places where fruit could be sold.

There was, however, a market for grain, which could be shipped to distant lands by boat or made into flour. There are many large valleys where in ordinary years the rainfall is sufficient to grow grain without irrigation. Consequently grain and cattle and sheep continued to be the chief productions until the coming of the railroads.

Sacramento had been connected by railroad with the East many years before Southern California had any outlet. When at last Los Angeles was connected with Sacramento by railroad, and the Southern Pacific Railroad had been built east across Arizona and New Mexico, a great market was opened.

Florida did not supply enough fruits and vegetables for the winter markets of the Northern and Eastern States and California began to furnish what was lacking. Soon the products of this region were

Bear Valley Reservoir, San Bernardino Mountains.

in demand and the quantity shipped increased year by year. The Santa Fe and Salt Lake Railroads when completed added new facilities for sending our products East and now many thousands of carloads are shipped each year. Refrigerator cars are used, so that those fruits and vegetables which ordinarily keep but a short time are landed in the East as fresh as when they left California.

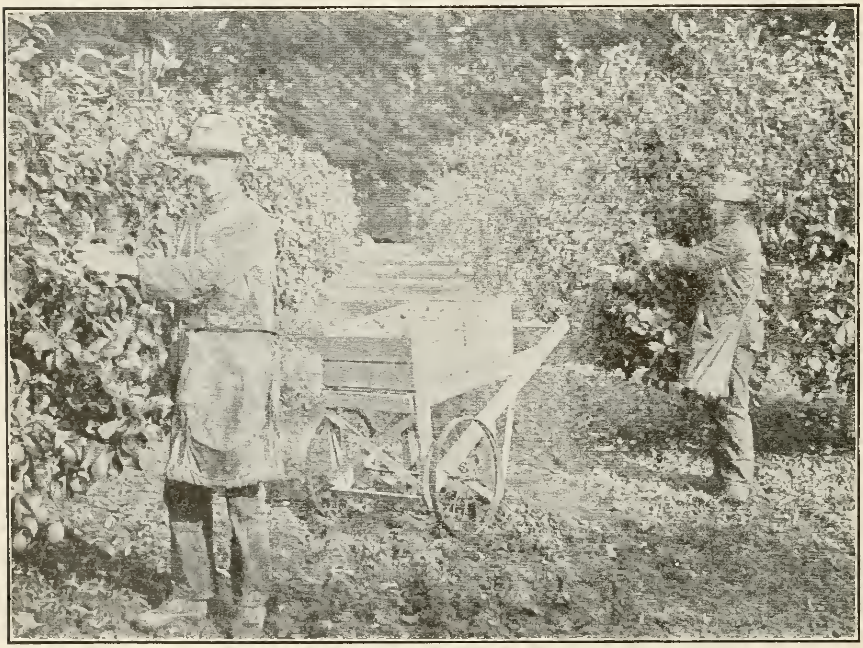
The growing of citrus fruits has now become the leading industry of the coastal slope, and one can ride for miles through almost continuous groves of orange, pomelo and lemon trees.

The navel orange, large, sweet and seedless, had made Southern California famous and is one of the finest in the world.

This orange was discovered, almost by accident, among some trees which had been planted at Riverside, and which came from Brazil through the Agricultural Department at Washington.

5. **Irrigation is the chief factor in the making of Southern California:** Without irrigation, however, most of Southern California would have remained in large ranches on which few people could make a living. Grain and cattle would have continued to be the chief productions.

Those parts better favored by Nature would include the mountain valleys, where the rainfall is sufficient for growing apples, pears, peaches, prunes and cherries; and the bottom lands along the streams, where under careful cultivation the deep, rich soil will grow certain fruits and other farm products without irrigation.



Picking Lemons.

For the successful growing of citrus fruits more water is needed than Nature supplies, and Southern California could never have become the "land of oranges" if it had not been possible to obtain water for summer irrigation.

The lands best suited to the growing of sweet oranges are not near the cool ocean, nor in the frosty river bottoms, nor the mountain valleys. They are the broad, gentle slopes lying all about the bases of the mountains. They include the higher slopes of the Los Angeles-San Bernardino Valley, and numberless other smaller valleys where the soil and climate are similar.

Nature had supplied the proper soil and temperature, but not the water needed to make the dry slopes bloom with orange groves.

The great stores of water placed in the gravels underneath the valleys are drawn upon by means of thousands of wells. The flood waters which once flowed unchecked to the ocean are held back by dams in the mountains and turned into the ditches when needed.

When we have succeeded in saving all the flood waters, there will without doubt be enough to supply all the valley lands and support millions of people in comfortable homes.

How much do we owe to the mountains for the growth in population and wealth of Southern California?

Do you know how much the people of Southern California owe the lofty mountains which look down upon this fertile and blooming region? We sometimes think the rough mountains are so much

Irrigating an orchard by checks.

waste and useless ground and that if they were taken away the country would support many more people.

This may be true of the mountains in some countries, but it is not true of those in California. If there were no mountains there would be less water, and with less water there would be fewer people, for water is the life of the soil and only by its aid can the soil be made productive.

How do we know that the mountains are such valuable water gatherers? We can see from the valleys that the clouds collect first over the mountains as the storms approach, and stay there longest when they depart. We know also that the storms are more severe on the mountains, for often when it has rained but slightly in the valleys the mountain streams become muddy torrents from the downpours which occur there.

We who have been in the mountains know that the higher we climb up their slopes the cooler the air becomes. The snows which whiten them throughout the winter and spring tell the same thing. It is, then, the cold air of the mountains which changes so much of the moisture of the clouds into rain and causes the snow to fall many feet deep. Thus they aid in supplying more water to the valleys, while the slowly melting snows keep up the flow of the streams far into the summer.

We can say, then, that without the mountains the rainfall would be so small there would be almost no streams. There would be few springs and little water for summer use. Southern California would be a desert and capable of supporting but few people.

Of what other uses are the mountains besides supplying water to make gardens out of a desert?

1. **The mountain slopes have a climate favorable to the growth of forests:** There are belts of vegetation on the mountain slopes of Southern California as there are on the Sierra Nevadas, but, as we shall see, they are different because the climate is not the same.

Few trees are found in the lowland valleys because of the light rainfall. In their place are many sorts of low shrubs and cactuses.

About the bases of the mountains and upon their lower slopes, the bushes grow larger and more dense. Among them are sagebrush, scrub-oak, manzanita, California lilac or chaparral.

In the cañons appear beautiful spreading oaks and sometimes cottonwoods and sycamores.

As we ascend to the plateau-like uplands and mountain valleys, we reach a region of heavier rainfall. Upon the moister shady slopes oaks abound, but upon the drier ones there is dense brush mingled with Spanish bayonet, which in the spring sends up a great stalk bearing a cluster of waxy white flowers.

The first conifer which we meet in our upward journey is the **big cone spruce**, which grows in the cañons of the San Gabriel and adjoining mountains. It is not until we reach an elevation of 5000 feet that we come to the main forest belt. The trees of this forest are largely **yellow pine**, the most widespread of all the lumber trees of California.

Higher still we find the cedar, sugar pine, fir, and last of all the dwarf white pine. The latter reaches almost to the summit of the highest peak.

Each kind of bush or tree which we have passed lives in a different climatic belt, but similar belts do not have the same elevation all over the state. In Northern California the yellow pine grows as low as 2000 feet, and its position in Southern California at an elevation of 5000 feet shows that we have to ascend 3000 feet higher to find a climate similar to that in the north.

The forests of the San Bernardino Mountains are the most extensive of any in this part of the state. In carrying on lumbering it is necessary to use the greatest care to prevent injury to the water supply. Already much harm has been done, for where the lands have been swept clear of trees it has been proved that the water runs off much more quickly than in the undisturbed forest.

All the timber lands of Southern California owned by the Government are now included in the National Forests and are carefully watched that neither lumbermen, stock nor fires injure them.

2. **The mountains afford summer pasture for cattle and sheep:** The mountain uplands, with their cool summer climate and abundant rains, form a good summer pasture for cattle and sheep. They have, however, been overstocked in past years and great damage has been done to the covering of vegetation which protects the slopes. This has been most serious in the San Gabriel Range because of its very steep slopes.

The overstocking results first in the killing of the grasses, other small plants, and young trees. This permits the water to run off more rapidly, thus affecting the springs, as well as cutting gullies in the soil.

The rangers who now have charge of the National Forests shut out all stock from the higher and steeper slopes. We can readily see that it is necessary to guard with greatest care the flow of the water or the orange orchards in the valley below may be ruined.

3. **The lower slopes and cañons form an excellent bee pasture:** Honey is one of the products for which Southern California is noted. The "**bee ranches**" are usually hidden away in the mountain cañons far from the settlements, for in such places is found the greatest number of honey producing plants. The white sage is particularly valuable for the quality of honey which it affords.

4. **The mountains make it possible to grow here the best of northern fruits:** In the mountain valleys fruits of more northern climes grow to perfection without irrigation. Apples are the most important of these fruits, and at an elevation of about 4000 feet are the equal of those raised in any other part of our country. Pears, peaches, prunes and cherries are also at home in these valleys.

5. **The mountain streams supply power for electricity:** Many of the mountain streams are large enough to be used for generat-

ing electricity needed for lighting and power purposes in the valleys below.

6. **The mountains furnish attractive scenery for the dwellers in the valleys:** There is no more attractive valley scenery in California than that of the mountains viewed from the Los Angeles-San Bernardino Valley. The lofty snow-capped peaks, rising so abruptly for many thousand feet, form a striking contrast with the blossoming orange groves.

7. **The mountains afford summer camp grounds:** The healthful, bracing air among the pines attracts large numbers of people during the summer months when the valleys are so warm. The value of the mountains for this purpose is becoming greater every year.

8. **The mountains contain veins of different minerals:** Veins of gold-bearing quartz and other minerals are found in the mountains. If there were no mountains it would be much more difficult to determine where the minerals are. The steep, rocky slopes make it easy to discover them and to mine them by means of tunnels.

How can we save for summer use the largest possible amount of the water which Nature furnishes this region?

We have learned that the productiveness of the valleys depends upon the water from the mountains. If we could save all the rain that falls, there would still be needed great care in its use that it might reach to the many acres yet unplowed. Let us see now what we must do to save this water.

1. **The vegetation on the mountain slopes must be protected:** If you will go into the desert which lies beyond the mountains of which we are speaking, you will find that the mountains there are bare and rocky. Little soil gathers as the rocks slowly decay and crumble, for plants are almost absent. The loose material, having nothing to hold it, is at the mercy of the occasional heavy rain or cloudburst. It is washed from the slopes down through the cañons and spread out on the vast desert plains. There is little to hold the water back and it runs quickly away, leaving the slopes almost as dry as they were before.

The lofty mountains of Southern California receive more rain than those of the desert and so bear a growth of bushes and trees. Their roots help hold the earth on the steep slopes, and the layer of decaying leaves and stems aids further in holding back a part of the water and so gives time for it to sink into the ground instead of flowing away. The water seeps down through the rock crevices and keeps alive the springs which feed the summer streams.

When fires destroy the brush and trees and the layer of humus, when the lumberman clears off the surface, or when stock trample and injure the surface, the water takes hold and washes the soil away; floods become worse and there is less water in summer.

2. **Great reservoirs must be built to hold the flood waters:** Water sufficient to irrigate many thousand acres still flows away unused to the ocean after the heavy winter storms. Many more

reservoirs must be built in order that all the valley lands may be cultivated and dotted with homes.

3. **The underground waters must be used with care:** So many wells have been bored throughout the valleys and the water has been used so freely that the stores in the gravels beneath are being drawn upon faster than Nature renews them.

When the top of the underground water layer is lowered, the wells have to be deepened, and if this continues the water after a time will be too far below the surface to be reached. We must be careful about using this water carelessly or drilling too many artesian wells and letting them flow unchecked.

How has Los Angeles added to its water supply?

We cannot increase the rainfall, and when we have used all the water supplied by Nature in any place, we shall have to go elsewhere for it if we wish more. The city of Los Angeles once obtained water enough for its needs from the river and from springs in the lower end of the San Fernando Valley.

As the city grew this supply became insufficient. No water could be obtained from other nearby sources, for all had been appropriated. But more must be had if the city and region about continued to increase in population.

We learn in our history stories of great water systems built long ago by the Romans which carried water from the distant hills to the cities, but none equaled that which has been built by the people of Los Angeles.

Far to the north, across the San Gabriel Range and the broad basin of the Mohave Desert, lies Owens Valley close under the eastern face of the Sierra Nevada Mountains. Through this valley flows a river of the same name, rising in the melting snows and glacial lakes near the summit of the mountains and emptying into the alkaline waters of Owens Lake.

The river carries much more water than was used by the ranchers of the valley, and, though it was so far away, Los Angeles decided to appropriate the surplus. But how was it to be taken across the hot desert and through the mountains? A huge cement pipe was built so that the water could not waste on the way and the mountains were pierced by tunnels several miles long. The total length of the aqueduct in its winding course is 260 miles.

Thus with infinite labor a river of water, sufficient to supply two million people, was brought from its basin beyond the mountains and deserts into another region where Nature never intended it to go.

Are there any other rivers that can be brought into Southern California?

Imperial Valley, once a part of the Colorado Desert, is being transformed into a garden of marvelous fertility by means of water brought from the Colorado River.

The Mohave River flows into the desert from the northern slope of the San Bernardino Mountains, but it would necessitate a tunnel many miles long to turn this back into the southern valleys.

Since the coastal slope of Southern California is so completely shut in on the land side, how is it that rail and wagon roads can reach it?

The mountains are not high and steep at all points. There are a number of gaps, or passes, as they are commonly called, and it is through these that the railroads and wagon roads have been built.

If you had come over the Santa Fe Trail in the days before the railroad and had gone westerly across the Colorado Desert from Yuma, you would have found no gap in the Peninsula Range, for it forms a continuous barrier between the desert and the ocean. For this reason it was not until many years later, when Southern California had become thickly settled, that a railroad was built from San Diego to Yuma, giving direct Eastern connection for this important seaboard city.

If you had gone northwest from Yuma bound for Los Angeles, you would, after having passed the Salton Salt Marsh, have at length climbed upward through a broad, low gap until from a height of only 2000 feet you would have looked down upon the valley of San Bernardino. This is the San Gorgonio Pass and is the easiest of all the routes across the mountains. Upon either hand of the pass, like great guardians, stand the two lofty peaks, San Gorgonio and San Jacinto.

If you had come over the Spanish Trail across the Mohave Desert, you would have ascended slowly to the summit of the Cajon Pass, which has an elevation of 4000 feet, and then have gone down the Tejon Cañon, which divides the San Gabriel from the San Bernardino Range.

If, after reaching Los Angeles, you had wished to go to San Francisco, you would have had the choice of several routes, each one making use of low places in the mountains.

You could have followed the route now taken by the Southern Pacific Railroad through the **San Fernando Pass,** up the Soledad Cañon and over its pass to the Mohave Desert. Then a journey of fifty miles across the desert, followed by the **Tehachapi Pass,** would lead you to Bakersfield in the San Joaquin Valley.

Or you could have followed the old stage road farther west. This road went over the **Francisquita Pass** to Lake Elizabeth, skirted the desert instead of crossing it, and reached Bakersfield by the **Tejon Pass.**

The new state highway between Los Angeles and Bakersfield follows the old stage road much of the way, but for twenty miles it has been cut in the sides and along the crest of a mountain ridge. This part is known as the "Ridge Road" and forms one of the most scenic automobile highways in California.

If you had wished to avoid the desert entirely and most of the mountains, you could have followed the trail of the Padres, the

King's Highway, or Camino Real, through San Fernando Valley and across the rolling hills to Ventura. Beyond which, in order to reach Santa Barbara, you would have had to pass close to the ocean, and perhaps get into the water if it were high tide.

Have earthquakes had anything to do with the making of Southern California?

If Southern California had not been a land of earthquakes there would have been no lofty mountains to condense the moisture of the clouds and supply water as well as many other things necessary to the prosperity of this region.

Long ago this part of California was dotted with low mountains, such as remain in the Mohave Desert and about Riverside. The whole region must have been dry and barren with no picturesque scenery.

Then there came a time of earthquakes. Fissures like those of the great earthquake of 1906 were formed in the earth and huge blocks of the solid earth began to rise and take on the form of mountains.

The San Gabriel is the oldest of these earthquake mountains. It is so old that the streams have had time to carve a multitude of deep, precipitous cañons between which the ridges are so sharp that there is often little more room than required by a trail. Such is the steepness of the slopes and the narrowness of the cañons that there is not a single ranch throughout the main portion of the range.

The San Bernardino Range was not made until a later time. It was lifted along a wonderful fissure which we find extending through the orange orchards in the edge of the valley. The line of this fissure is marked by springs, cienegas or meadows, and low ridges.

We can follow this fissure far to the northwest until it connects with the one that made the San Francisco earthquake of 1906. This fissure was the scene of a severe earthquake in 1857, when the ground opened and slipped, making ridges and hollows. The Mormon settlers, who had then recently come to San Bernardino Valley, reported that the earthquake threw their horses and cattle to the ground.

The summit of the San Bernardino Range is not at all like that of the San Gabriel. This range is so much younger that the streams have not yet had time to cut deep cañons in the once gentle slopes. A large part of the surface of this lofty region remains much as it was when it was a lowland. There is a beautiful drive for many miles along the flat top of the northern portion of the range, and back of this are numerous valleys and green meadows. The Bear Valley reservoir occupies one of these large valleys.

We will now visit the San Jacinto Valley, to the north of which rises the steep slope of the San Jacinto Mountains. We know that this range was also formed by earthquakes, for a fissure extends along its base in the edge of the valley. Severe earthquakes have occurred here since the valley was settled.

We now will travel southwesterly across a country made up of low and very old mountains which have been almost worn down. We finally reach the pretty Temecula-Elsinore Valley. This is an earthquake valley, but made long ago. The steep mountain wall, beginning near Temecula and ending with the Santa Ana Mountains, many miles to the northwest, was made by earthquakes.

Long ago the region of the Temecula-Elsinore Valley sank, leaving a great mountain wall on the west. In a portion of this sunken valley lies Lake Elsinore. The San Jacinto River, which feeds the lake, once flowed directly west to the ocean across where now the Elsinore Mountains rise 2000 feet above the valley. Is it not strange and wonderful how Nature has broken and changed the surface of the earth, lifting it in some places and dropping it in others?

From these things we learn that the mountain ranges of Southern California are great blocks of the earth's crust which were raised high in the air during repeated earthquakes. We learn also that since their uplift the mountains have been much worn away by running water, and that the newer ones have gentle upland slopes, while the older ones have sharp ridges and deep, narrow cañons. If it were not for earthquakes, then, this region would be an almost uninhabitable waste.

What other forces have aided the earthquakes in making the scenery of this region?

The earthquakes made the lofty mountain ranges somewhat as they would appear if all the cañons were filled up and the tops of the ridges smoothed off. The picturesque appearance of these mountains as they rise before us today is the result of many forces of Nature which are quietly and invisibly working all about us.

Heat and cold and carbonic acid make the rocks crumble and turn to clay and sand. The waters of the winter storms pick up the little particles and carry them down to the valleys. They also pick up larger fragments which grind along the bottom of the channels, ever wearing them deeper. Thus the deep cañons and sharp, jagged peaks have been made.

Mounts San Gorgonio and San Bernardino form the highest land in Southern California. Upon their northern slopes there were once small glaciers. These glaciers were the most southerly ones which ever existed in the United States. They have left two little lakes and long ridges of loose rock called **moraines** to show that they were once here. This loose rock holds vast quantities of water, giving rise to the great springs which form the chief source of the summer flow of the Santa Ana River.

Long ago there were volcanoes in Southern California, but the lava has mostly decayed and been washed away. A remnant of lava is still to be seen upon the Santa Rosa Plateau west of Temecula, where it forms a peculiar **table mountain.**

What mineral deposits has Southern California?

The two most important mineral products of California are quite unlike. The first discovered was gold, which is found in many parts of the higher mountains. The second is petroleum, which is found in the lower mountains and hills and sometimes in the valleys.

The oil deposits of Southern California are found in two belts. One extends from Fullerton, past Whittier to Los Angeles and west toward Santa Monica. The other extends nearly the whole length of the Santa Clara Valley in Ventura County.

The oil is so deeply hidden in the earth that, although springs of thick oil, often called **brea**, have been known from the earliest days, it was many years before it was found in large quantities. Thus Nature, having given this region small supplies of wood, and only one coal deposit, that at Elsinore, has more than made up for the lack of other fuels in the vast stores of oil.

The dark, thick oil is best for fuel purposes and is obtained from the shallower wells. Some of the wells are 4000 feet deep and the oil from these is light and thin. The gas which accompanies the oil is used for lighting as well as for running machinery.

The light oil is best suited for refining. From it is produced gasoline and the clear petroleum which is used in lamps. The heavy residues from refining are used for innumerable purposes, such as lubricating machinery, and making paraffine and dyes.

Near Los Angeles is a large area covered with springs and pools of thick, tar-like oil or brea. These springs have existed for thousands of years, and contain a most wonderful record of the animals and birds that formerly inhabited California.

Attracted by the salty water, large numbers of animals and birds fell or were crowded into the tar, where they died. This tar preserved their skeletons in a remarkably perfect condition. Thousands of specimens belonging to hundreds of different species have been dug out and arranged for study.

The first placer gold known in California was found in the mountains north of the upper Santa Clara River near the stage road running from Bakersfield to Los Angeles.

Gold-bearing quartz veins have been worked in many parts of the Sierra Madre Mountains and in the Peninsula Range.

Other minerals of value in various industries are scattered through the mountains. At Colton is a hill of limestone used in the manufacture of quick-lime and cement. In Riverside County are beds of clay used in making an excellent quality of sewer pipe. Another quality of clay or kaolin found here is suitable for pottery and porcelain.

In Riverside County there are also deposits of asbestos, talc and other minerals. In San Diego County are found beautiful tourmalines, valuable for jewelry.

kunzite

What four sorts of slopes has Southern California, each with its own soil, climate and productions?

1. **The mountains and highland valleys:** The mountain slopes are usually steep and rocky and but few people live upon them. The valleys, which are above 4000 feet, are most numerous in the San Bernardino Range. They are too cold for profitable farming and are used as pasture lands.

The mountain valleys from 4000 feet down to 1500 feet are numerous in San Diego and Riverside Counties. They support many people who gain a livelihood from raising stock, grain and deciduous fruits, among which the apple is the most important.

2. **The mesas and slopes about the bases of the mountains:** All about the bases of the mountains are broad, gently inclined slopes which from a distance appear as even as a plain. Pasadena is built upon a slope of this kind which extends along the base of the mountains all around the northern and eastern sides of the Los Angeles-San Bernardino Valley. We travel over this slope in going from Pasadena to San Bernardino.

Back of San Bernardino and Redlands the streams have carried away the lower parts of these slopes, so that they have the appearance of **mesas** lying against the mountains.

These lands have a gentle, even slope, because they were built up by water and are found always in regions of light rainfall. The torrential streams of winter coming down through the mountain cañons loaded with rock fragments spread out upon reaching the valleys and drop the greater part of their burdens.

The name **debris fan** is often given to a deposit built up in this manner. If you will stop and think how deltas are formed, you will see that a debris fan is really one kind of a delta. Many such debris

A wonderful spring which helps to keep up the summer flow of the Santa Ana River. The water issues from glacial gravels on north slope of San Gorgonio.

fans or cones joined together make the great plain of which we are speaking, which lies about the bases of the mountains.

If you could visit the Tejunga River as it flows through the San Fernando Valley in time of flood, you would see how the streams build up these debris fans. They wander here and there without any banks, cutting away the gravel in one place, building it up in another, spreading out sometimes a mile or more in width.

The soil of these slopes and mesas is usually a sandy or gravelly loam, well drained and very fertile. Their soil and climate are suited to growing the best and sweetest oranges, and so we find upon them the most extensive groves in Southern California. They are more free from frost than the lower land along the streams, and are for that reason much sought after.

3. **The hills and mountain valleys below 1500 feet:** There are large areas of land, including southern Ventura County, parts of the San Fernando, Temecula-Elsinore, Perris, San Jacinto and other valleys, which are better adapted to diversified farming. In these we find orchards of both citrus and deciduous fruits, large grainfields and thousands of cattle.

4. **The lowland valleys and coastal region:** The bottom lands along the streams are more frosty than those of the two divisions which have just been described. They are especially suited to dairying, the growing of alfalfa and sugar beets. A large sugar factory is located at Chino. Corn and all sorts of vegetables do well upon these lands.

The lowlands of the coastal region form one of the most impor-

Celery field on the rich bottom land of the Los Angeles plain.

tant bean-growing districts of our country. The soil is a sandy loam and is also suited to sugar beets.

Along the coast south of Los Angeles the soil contains much humus and is known as **peat land.** Here are grown valuable crops of celery and asparagus.

How Southern California looked when the ocean stood higher than it does now.

On the slopes of San Pedro Hill, which rises all alone upon the coast southwest of Los Angeles, there are ancient ocean cliffs, the highest of which is 1200 feet above the present ocean. Since most of the valleys of this region are not as high as that, they must have been submerged at the time the waves beat against this cliff, and the geography must have been very different from what it is now.

We will take the inclined railway back of Pasadena and ascend to Mt. Lowe, from which point we look over a great stretch of country. Upon a summer morning when the fog covers all the lowlands, we can form a picture of how the country looked when it was submerged 1200 feet by imagining the fog with its waves to represent the ocean.

On the north and northeast the San Gabriel and San Bernardino Ranges rise boldly above the fog. On the east of this great bay of fog appears San Jacinto and other scattering mountains. On the southeast the Santa Ana Mountains rise all alone with a bay of fog behind them. On the west the Santa Monica Range appears as a long ridge, while the San Fernando Valley forms a great circular bay open to the ocean through the cañon of the Los Angeles River.

What valley is that across which we look from Mt. Lowe?

As the fog disappears we look over a vast lowland region stretching from the ocean eastward to the base of the San Bernardino Range. In the middle of this lowland and dividing it into two parts appear the broad and low Puente Hills stretching away to the Santa Ana Mountains.

The western part of this lowland, extending from the City of Los Angeles south and west to the ocean, is the Valley of Los Angeles, sometimes called the Plain of Los Angeles because of its smooth and even surface.

The eastern part of the lowland lying beyond the Puente Hills is the San Bernardino Valley. It contains a number of isolated peaks, while branching valleys extend away to the south.

The two valleys are connected by the broad, gentle slope along the base of the San Gabriel Range and by the Cañon of the Santa Ana River. Because the hills which divide this region into two parts are low, and the mountains which surround it are high, we speak of it as one great valley, calling it the Los Angeles - San Bernardino Valley.

How is this valley watered?

Our study of California has already taught us that we cannot tell how large a stream is by the area of its basin. The amount of water which it carries is dependent far more upon the position, height and extent of the mountains in which it takes its rise.

The Santa Ana has not only the largest basin of any river in Southern California, but it also has the advantage of rising in the highest mountains. Its summer flow is much increased by large springs in the glacial gravels on the north slope of San Gorgonio and San Bernardino Peaks and also by summer thunderstorms which at times are very heavy. Bear Valley Reservoir, one of the largest in Southern California, is also tributary to the Santa Ana River.

The Santa Ana River supplies water for irrigating the extensive orange groves about Redlands and Riverside. Between the point where the river breaks through the Santa Ana Mountains and the ocean, it splits up into a number of channels which are dry most of the year, although an abundance of water can be obtained from shallow wells dug in the channels.

The San Gabriel is the next most important river. It rises in the highest peaks of the San Gabriel Range, but it also is dry long before reaching the ocean. The river carries a great volume of water after the winter storms, but it flows through such deep, narrow cañons that no reservoirs have yet been built to save its flood waters.

An ostrich farm near Los Angeles.

The Tejunga River, which furnished most of the water for the City of Los Angeles before the building of the great aqueduct, is a most curious stream. It rises in the San Gabriel Range and flows west into the San Fernando Valley, where, during most of the year, it sinks in its sandy bed. At the lower end of the valley it reappears as springs and below these is known as the Los Angeles River.

The bed of a river which is dry throughout most of the year and contains water only during times of flood is called a wash. All streams of desert and semi-desert regions have channels of this kind, marked by lines of pebbles and boulders. The wash has usually no distinct channel or banks, for its bed is often above the level of the adjacent country. Such a torrential stream is difficult for railroads to bridge because the waters are as likely to flow in one place as in another.

The three rivers which we have mentioned flow across the Plain of Los Angeles in channels which branch here and there and are forever changing like those of the deltas of the Mississippi and Colorado Rivers.

How is it that the Tejunga furnishes much less water in summer than it ought?

Many square miles of the mountain basin of the Tejunga River have been burned over. Where once there was a pine forest now appears chaparral. The bed of the stream is exposed to the hot sun instead of being shaded, so that a large part of the summer flow is evaporated in the air.

What determined the site of the Pueblo of Los Angeles?

Portola, in the journey northward which resulted in the discovery of San Francisco Bay, passed the spot where Los Angeles now stands. Some time later, in the year 1781, the place being thought a favorable one for a settlement, a party of colonists was brought from Mexico. The chief object in making a settlement here was the raising of provisions for the soldiers in the presidios.

An abundance of water in the Los Angeles River at the point where it breaks through the east end of the Santa Monica Range, and the broad, fertile plain spreading out to the south and west, were the two things which determined the position of the new settlement. It is not likely that the founders saw in the location any particular advantages for a great city, such as has sprung up here, but rather the immediate needs of a young colony.

What are the advantages as well as disadvantages in the situation of Los Angeles?

There were many things about the situation of Los Angeles which favored the growth of the little pueblo into an important place, when at last the attention of people began to be directed toward Southern California and settlers commenced to come in.

The first of these advantages was its convenience of access from all parts of the south. It was on the King's Highway from San Diego to the North Coast Missions and settlements. In fact, no one could go northward without passing by Los Angeles. The Cahuenga Pass to the northwest of the Pueblo and the Cañon of the Los Angeles River on the north offered the only two convenient routes to the San Fernando Valley. From this valley two ways led northward—the King's Highway by way of the coast valleys, and the other across the mountains and desert to the San Joaquin Valley.

A scene in the business district of Los Angeles.

All emigrants from the East coming by way of Southern California had first to go to Los Angeles if they wished to reach the mines. Los Angeles was, then, the terminus of both the Santa Fe Trail by way of Yuma and the Colorado Desert, and the Spanish Trail which led across the Mohave Desert and through the Cajon Pass to the Valley of San Bernardino. From the latter place the traveler could follow either the broad slope along the base of the mountains past the Mission of San Gabriel or continue down the Santa Ana River through the mountains to the Plain of Los Angeles.

Los Angeles was, even in the early days, an important meeting place for all the trails and roads of this region. For this reason it was also an important trading point.

There were, however, disadvantages in the situation of Los Angeles. It was not on any navigable stream, nor had it any convenient water power before the days of electricity. Its most important disadvantage was its situation, sixteen miles inland from the sea. A situation on the sea was particularly important in the early days, when all freight and much of the travel had to come by water. San Diego and Monterey were much better off in this regard, but they were not on important land routes nor centrally located.

Why has Los Angeles outgrown the other cities of Southern California?

The central location of Los Angeles and the ease with which it could be reached, which were important things in the early days, have also been the chief causes of its growth in later years.

The railroads when they came naturally followed the easiest routes, which were those of the old trails. They also found the terminus of the trails their most convenient terminus, and so the town became an important railroad center. For this reason it became the business and commercial center of the whole region.

Every one of the old trails has been followed by a railroad except the stage route from Los Angeles to Bakersfield, and it is certain that in time a railroad will follow this route a part of the way.

The Southern Pacific came across the Colorado Desert and through the San Gorgonio Pass. The Santa Fe and Salt Lake Railroads came by way of the Cajon Pass and San Bernardino. The Santa Fe followed the old route down the coast to San Diego. The Southern Pacific went north across the mountains and desert to the San Joaquin Valley, and up the coast near the path of the King's Highway.

How did Los Angeles become a seaport?

As Los Angeles grew in commercial importance it began to feel the need of a port on the sea. Sixteen miles to the southwest lay the little harbor of San Pedro which could be entered only by small coasting vessels.

To make it possible for large boats to discharge cargoes there

A scene in the residence district of Los Angeles.

in safety, the Government has built a great breakwater two miles long. Thus there has been created an artificial outer harbor, commodious and safe, in addition to the natural inner harbor, which is being enlarged and deepened.

Los Angeles has become a deep-water port and can compete with other cities in foreign commerce. It has become a port, not by moving sixteen miles to the ocean, nor by digging a canal and bringing the ocean to itself, but by simply enlarging its boundaries to take in San Pedro.

What other causes have aided in making Los Angeles one of the two largest cities in California?

Los Angeles lies in the midst of an agricultural and fruit-growing district of great extent and remarkable fertility. Upon all sides lie broad valleys of the richest soil which are becoming more highly cultivated and densely populated each year. Los Angeles is the natural center for supplies and for shipping fruit and other products.

Los Angeles and the region about it has become renowned all over the United States for its mild and agreeable climate. Every winter sees Southern California filled with visitors. Many of these people buy land and make their homes there. This has been one of the most important reasons for the rapid growth of Los Angeles.

How is it that Los Angeles, which remained an unimportant place for so long after San Francisco became a great city, suddenly began to grow rapidly and in a few years became its rival?

As we have already learned, Southern California was too remote from the mines to be much affected by the early emigration. After the railroads came, and it was shown that this apparently dry region really had a large supply of water, and was well suited to the growing of citrus fruits, and that it had in addition a mild and agreeable climate and attractive scenery, then the tide of emigration turned in this direction.

No city in our country, except San Francisco during the gold excitement, ever grew so rapidly as Los Angeles. It became the goal of thousands of people who wished to escape the cold winters of the northern states. It has been the visitors and the settling up of the rich surrounding valleys rather than its commercial interests that have made Los Angeles a great city. For this reason it is a more desirable place for a home than is a city whose importance is based upon manufacturing.

The industries and trade of Los Angeles.

The manufacturing industries and foreign commerce are of less importance than those of San Francisco, because, as we have seen, the growth of the city has been due to other things.

Los Angeles has, however, trade and manufacturing interests which are growing in importance. This growth is due to the increase in population of all Southern California, to the unlimited supplies of petroleum and natural gas for fuel and power, and to the making of the deep-water harbor at San Pedro.

Los Angeles is the only city in our country that has an oil field within its limits. Hundreds of wells were at one time in operation in a thickly settled residence district.

For what is Los Angeles particularly noted?

Los Angeles is noted, first of all, for its climate. Its center is sixteen miles from the ocean, so that it occupies an intermediate position between the cool sea shore and the hot interior.

Los Angeles is noted for the bustle and activity of its streets, and the energy of its people. The business section is now dotted with huge office buildings or "skyscrapers," which have taken the place of the smaller buildings of earlier days.

The city has an excellent system of parks, covering in all about 4000 acres. The largest of these is Griffith Park, which lies in the picturesque hills upon the northern border. Elysian is another large park and is given over to raising wild plants of all sorts.

The mountain and seaside resorts reached from Los Angeles.

A short ride takes one to Pasadena and the foot of the San Gabriel Range, from whence an inclined railway ascends to a pleasant summer resort on a lofty spur of the mountains. Not far away is Mt. Lowe and its noted astronomical observatory.

An hour's ride to the south brings one to Long Beach, an important city which owes its beginnings and rapid growth to the attractions offered by its fine beach. The city is now developing important manufacturing industries.

To the west is the picturesque city of Santa Monica, on Santa Monica Bay. Immediately adjoining on the south are the important summer resorts of Ocean Park and Venice, where during the height of the summer the beach presents one of the most picturesque scenes imaginable. Still farther along the beach toward the southward is Redonda, another attractive resort.

Why are the lands about Los Angeles so fertile?

Long ago the Plain of Los Angeles and the adjacent valleys were beneath the sea. The mountain streams brought mud and sand and the currents spread these over the bottom. When the land rose and the sea was pushed back to where it is today, a rich layer of earth covered the whole valley region.

Back of the new shore line the land was low and marshy, with here and there little lakes such as we now see, in which grew tules and other water plants. These marshes after a time became the peat lands, which grow luxuriant crops of celery and asparagus.

A large part of the vegetables and berries for the city market are grown upon the lowland along the Los Angeles River, where there is rich alluvial soil and plenty of water.

What has made Pasadena the most famed winter resort in our country?

San Pedro Harbor.

Pasadena is situated upon a gently sloping plain at the foot of the steep and rugged San Gabriel Range. Its situation gives it a most agreeable and healthful climate. It is protected from the desert winds and its elevation of 800 feet places it above the winter fogs which settle in the lowlands. It is less frosty in winter and cooler in summer than the lower valleys.

For many years after San Francisco grew to be a great city, the land on which Pasadena stands continued to be a cattle and sheep range. When the winter visitors began to come, the value of this picturesque location was seen and a town sprang up. Today Pasadena is a beautiful city with its shaded streets and comfortable homes set among lawns and flower gardens. On the new year there is held a pageant and flower festival.

The country from Pasadena to San Bernardino.

Continuing eastward along the base of the mountains toward San Bernardino we pass a continuous succession of orchards with here and there a vineyard. Flourishing towns are scattered thickly along the route. The largest of these is Pomona.

The Valley of San Bernardino.

The first settlers of this valley were Mormon emigrants from Utah who were attracted by the extensive meadows near where the city now stands. The Santa Ana River flows through the lower end of the valley, which is circular in shape. San Bernardino is situated in the center, while orange groves extend away toward the mountains in almost every direction.

What has made Redlands and Riverside famous?

Wherever the navel orange has gone, there we hear Riverside and Redlands spoken of. It has made all this part of California famous and every visitor wants to see the place where it originated.

Both cities are well built and attractive. They are especially noted for the beautiful drives which extend out into the country in every direction. The broad avenues are lined with different kinds of trees, including palms, while back of them lie groves of orange, pomelo and lemon trees, among which nestle pretty homes.

From the top of Mt. Rubidoux, near Riverside, we can get a good idea of the geography of the valleys through which the Santa Ana River flows. Here and there appear barren granite mountains, contrasting strangely with the green orange groves upon the smooth, fertile slopes about their bases. If it is winter, the blossoming trees make an interesting picture with the snow-covered mountains in the background.

The San Jacinto, Perris and Elsinore-Temecula Valleys.

These are three interesting valleys, which lie between earthquake mountains. The San Jacinto, a very curious river, drains these valleys. It rises in the lofty San Jacinto Mountains, but sinks below the town of San Jacinto at the lower end of the valley.

A short distance to the west the river rises again and during

An avenue, Pasadena.

the rainy season flows on through Perris Valley to Lake Elsinore. The climate is so dry now that this lake rarely overflows, but long ago it was much wetter and a river ran out of the lake down the Temescal Valley to the Santa Ana. How the earthquakes made the Elsinore Mountains and the lake and turned the river away from its course to the ocean is a story of which we have already heard something.

The three valleys of which we are speaking are not too high for oranges, which do well in parts of them, but the deciduous fruits are more extensively grown. These include pears, peaches, apricots and plums. Many olives are grown in the Temecula-Elsinore Valley. Perris Valley is largely devoted to grain and alfalfa, while fruit, alfalfa and grain are grown in the San Jacinto Valley.

Why is the Santa Ana region so rich and productive?

The city of Santa Ana is situated upon the southern part of the Plain of Los Angeles in the midst of a rich and fertile district, watered by the Santa Ana River.

This region has been the delta of the Santa Ana River for thousands of years. The alluvial soil is deep and an abundance of water is obtained at a slight depth.

Upon the higher lands of the district, oranges, lemons and olives are grown. On the lowlands are orchards of walnuts, fields of corn

Mission Inn, Riverside.

and alfalfa. Nearer the coast, where it is cooler and moister, are extensive fields of lima beans, sugar beets, celery and asparagus.

Why has the growth of San Diego been much slower than that of Los Angeles or San Francisco?

San Francisco became a great city almost in a night because it had a good harbor and was near the gold mines with which it had direct and easy communication. It was the natural center for the distribution of supplies and the starting point for the mines of all those who came to California by water.

A generation later Los Angeles, almost as quickly, became a city and a rival of San Francisco. This sudden growth was due to the coming of the railroads, to the central location, and the attractions of a mild and healthful climate.

San Diego is situated upon a bay of the same name in the extreme southern part of California. Although having the second best harbor upon the coast, it remained an unimportant place for many years. This was due in part to its lack of a central location, in part to the difficulty of building a railroad across the mountains which lay behind it and thus obtaining direct connection with the East, and partly to the belief that the country around the Bay of San Diego was dry and worthless, with little water for irrigation.

What finally led to the growth of San Diego and the settlement of the surrounding country?

The good harbor was of little use to San Diego until a railroad came and connected it with the outside world by land, so that people could reach the place easily, become acquainted with the pleasant climate and discover the fertility of the dry lands when water was taken to them.

The country east of San Diego rises through many valleys to the summit of the broad Peninsula Range with its heavy rainfall and forests of pine. Beyond the mountains lie the Colorado Desert,

Chula Vista grammar school near San Diego.

and Imperial Valley. Although one branch of the old Santa Fe Trail led over these mountains, yet it was some years after Los Angeles had railroads before an attempt was made to build a railroad across them because of the absence of any easy pass like the San Gorgonio. A railroad has now been completed across the Peninsula Range through Imperial Valley to Yuma, so that the city has finally secured a direct eastern outlet.

The first railroad that reached San Diego came by way of San Bernardino, Elsinore and the Temecula Cañon, because this was the easiest route. Finally a line was built directly down the coast following the trail of the Padres. The coast lands were found to be so rough that many difficulties were encountered in its building. For the first few miles the line south of San Juan Capistrano has taken advantage of a strip of sandy beach underneath lofty cliffs. This was made possible because the coast has recently risen a few feet, so that the waves no longer beat against the old cliff.

With the railroad came winter visitors who found at San Diego a remarkably mild winter and summer climate. Great hotels were built, the finest being upon the peninsula in front of the bay. Upon the ocean side of the hotel is fine surf bathing, while upon the other side are the quiet waters of the bay, suitable for boating.

Mission Valley, like many others that cut through the mesa lying between the mountains and the ocean, has been cultivated since the days of the Padres. As the population grew in numbers and the need of water increased, it was found that, by building reservoirs in the mountains to retain the heavy rainfall on these high lands, an abundance of water could be had.

When canals had been dug and water supplied to the mesas, whose desert-like character had given the country a forbidding appearance, they proved to be rich and productive.

Easy means of access by steamer or cars, a delightful climate

Mt. San Antonio (Old Baldy) from near Santa Ana.

and an abundance of water for irrigation brought many thousands of visitors, large numbers of whom remained and made their homes.

San Diego has become the fourth largest city in the state, and is growing rapidly. It has important commercial advantages, one of which is the fact that it is the nearest city to the Panama Canal upon the Pacific Coast of the United States.

The attractions of the San Diego Bay region.

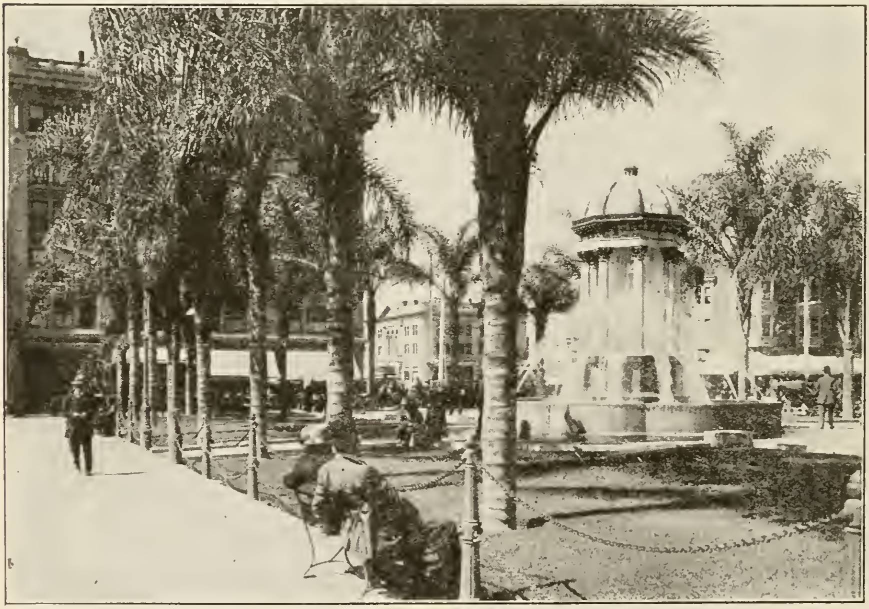
San Diego has the safest bay on the coast for pleasure boating. Directly in front of the bay and separating it from the ocean is the Coronado Peninsula with its great hotel, beach and surf bathing. Upon Point Loma, which incloses the bay upon the west, is a noted theosophical school and naval station.

A few miles to the north are the famous La Jolla caves and seaside resort. To the southeast is the Mexican town of Tia Juana with its interesting inhabitants. In the edge of the mountains lies the great Sweetwater reservoir and the beautiful Cajon Valley.

On the mesa back of the city is its great park, once covered with sage brush but now turned into a beautiful garden, in the midst of which has been built in old Spanish style the attractive buildings of the Panama Exposition.

What has made possible the development here of a rich fruit and agricultural district?

In the Peninsula Range which extends south through San Diego County into Lower California, we find the source of the prosperity



The Plaza, San Diego.

of the region. Without the mountains there would be no water for irrigation, and the larger part of the thousands of acres of fertile land along the coast, which receives only ten inches of rain annually, would have remained sparsely settled.

The winters are so mild near the ocean that the scanty rains do more good than they would in most parts of the state. On ordinary years they will produce grain and a good growth of natural forage. Such products as grapes and almonds and walnuts can be grown without irrigation if the land is well cultivated.

As we ascend the mountains from the coast, the rainfall increases, and on their summits it is nearly as heavy as in the high mountains lying back of the Los Angeles-San Bernardino Valley. Many rivers rise in these mountains, but they ordinarily sink in their sandy beds before reaching the ocean. Reservoirs are being built near their sources and there will finally be enough water available to irrigate all the lands that need it.

In what way is the Peninsula Range of more importance than the San Gabriel?

The San Gabriel Range rises very boldly from the Los Angeles-San Bernardino Valley, and because of its narrow cañons and steep slopes contains almost no inhabitants.

The Peninsula Range, on the contrary, rises gradually and has many valleys inhabited by people engaged in stock raising, general farming, and fruit growing.

The lower mountain valleys grow citrus fruits of the best quality, as well as olives and figs, but are particularly noted for their excellent raisins. The upper valleys are adapted to growing the de-

San Gorgonio Pass from the desert slope; the best of all the gateways from the east to the coastal slope of California.

ciduous fruits, the Julian district being especially noted for the quality of its apples.

The most of the mountain valleys are dotted with oaks. Above 5000 feet are forests of pines, which are most extensive on Cuyamaca Mountain.

What four sorts of slopes, each with its own productions, do we find in San Diego region?

The first slope is the rough granite mountains which, above 5000 feet, support forests of pine, cedar, sugar pine and fir.

The second slope includes the oak-dotted mountain valleys with their orchards of different fruits.

The third slope is formed by the lower alluvial valleys which extend down to the ocean. The soil of these valleys is very fertile. The first cultivated lands were in these lower valleys, since water for irrigation was easily obtained.

The fourth slope includes the mesas which rise to an elevation of 1000 feet along the base of the mountains and slope toward the ocean. They were left by nature dry and barren, but under the influence of water they produce abundantly.

What gems have made San Diego famous?

Gold mines have been worked for many years in the Julian district, but the minerals which have made San Diego famous are beautiful gems known as tourmaline and Kunzite. These crystals, with their clear, greenish and reddish tints, are prized very highly for all kinds of jewelry, and by some people are admired almost as much as diamonds.

Seventeen Palms Spring in the Borego Desert, west of Imperial Valley.

How can we account for the salt lagoons which are found along the coast?

This question leads to the interesting story of how the ocean and the land have changed places.

Once the ocean stood high along the mountains as it did in the Los Angeles region. The streams brought down sand and gravel and distributed it over the bottom, making the gently sloping plain which we know as the **mesa**.

Then the land began to rise and the shore retreated until it was far out under the present ocean. The rivers ran down across the **mesa** and cut cañons which finally widened to valleys. These are the valleys in which the first missions and settlements were located.

After this the land sank again and the ocean flooded the lower ends of the valleys. The ocean waves threw up pebbly beaches across the fronts of these bays and formed the salty lagoons which we find there today.

The land and ocean seem ever fighting for the mastery. The last victory in this region has been won by the land, for the ocean has abandoned the cliffs below San Juan and built a beach in front which, as we have learned, is now used by the Santa Fe Railroad.

The story of Point Loma and San Diego Bay.

Point Loma was once an island behind which the waves and currents made a long, shallow bar, which was the beginning of the Coronado Peninsula. The San Diego River brought down so much mud and sand during floods that it finally built a delta out to the island, and in this way made San Diego Bay and False Bay.

The story of Point Loma is also interesting because long ago it was visited by earthquakes so severe that the layers of rocks were broken in hundreds of places and shoved past each other. This, as we have learned, is one of Nature's ways of making mountains.

The country between Los Angeles and Santa Barbara where gold and petroleum were first discovered.

Gold and petroleum are the most valuable minerals of California, and both are found in the mountainous region which includes Ventura and parts of Los Angeles and Santa Barbara Counties.

If we could look down from an aeroplane upon this region, it would appear at first sight to be covered almost wholly with mountains; a careful look, however, would show one long valley. This is the Santa Clara, sunk deep among the mountains and widening to form a plain as it approaches the ocean. North of Los Angeles we could make out the San Fernando Valley, almost circular in shape, and in the mountains north of the city of Ventura the beautiful Ojai Valley.

The mountains of the northern part of this district are high and rugged, for this is the meeting point of many ranges. The Tehachapi comes from the east, the Sierra Madre from the southeast, and the Santa Ynez and Coast Ranges from the west.

The group formed by their meeting point is called the San Emedio Mountains. From the summit of Pine Mountain, the highest peak, nearly 10,000 feet above the ocean, we can look into four of the seven California provinces. These are the Mohave Desert (a part of the Great Basin), Southern California, the Coast Ranges, and the San Joaquin Valley.

The few people who live in this remote mountainous district depend upon mining and stock raising for a living.

The Santa Clara River has a basin next in size to that of the Santa Ana River in Southern California. Most of the year the Santa Clara River carries little water on the surface, for it flows a long distance over a sandy bed.

How do the mountains and valleys determine the lines of travel?

The mountains north of the Santa Clara Valley are so rough and steep and cut by so many deep cañons that no road has been built across them. We have already learned that two main routes were opened from Los Angeles northward—one, going to the east of these mountains, has been described; the other, going to the west, was known as the King's Highway.

The King's Highway led from Los Angeles through the Cahuenga Pass in the Santa Monica Range, skirted the San Fernando Valley, crossed the high valleys of Ventura County (sometimes

The beautiful beach at Santa Barbara.

called the Semi Plateau) to the mission town of San Buena Ventura. Where the rugged mountains of which we have spoken come down to the ocean, a few miles northwest of Ventura, the trail led down to the beach under the cliffs.

There is one other route, in addition to the King's Highway, by which we can go from Los Angeles to Ventura. That is by the old Bakersfield stage route through the San Fernando Valley and over the pass of the same name to the upper Santa Clara River. From here there is an open valley leading all the way to the ocean. This route has been used by the Southern Pacific Railroad, but as it was not direct, a new line was opened by tunneling through the Santa Susana Mountains at the western end of the San Fernando Valley.

How has the roughness of this region between Los Angeles and Santa Barbara affected its settlement and industries?

Because the interior is made up almost wholly of mountains, the larger part of the population lives in the valleys near the coast.

The higher mountain slopes support a growth of oak and pine. The middle and lower slopes north of the Santa Clara Valley are covered with brush, while south of the valley they are more open and grassy. The raising of cattle and sheep was, then, the leading industry until the discovery of large quantities of oil.

The mountains upon both sides of the Santa Clara Valley, throughout nearly its whole length, have been found to contain great stores of oil. In traveling through this valley one is hardly ever out of sight of oil derricks.

The oil was first obtained from springs. Then tunnels were run in the mountain sides and the oil was allowed to run out. Now most of the oil is pumped from wells, some of which are nearly 4000 feet deep.

What is there about the Santa Clara Valley which makes it excel in the production of sugar beets, beans and lemons?

The valley widens as it approaches the ocean and forms a fertile plain of many miles' extent. This lower part, being exposed to the cool, damp ocean winds, is not suited to growing fruits, but does produce luxuriant crops of beets and beans. The quantities of these two things raised here are in excess of any other district in California. At Oxnard there is a factory for making sugar from the beets.

A little farther up the valley from the ocean, the climate is warmer and suited to the growing of lemons. And so we find here some of the largest lemon groves, and also orchards of walnuts and olives.

If we continue up the valley we soon leave behind the cool ocean winds and find that groves of orange and pomelo predominate.

The picturesque Ojai Valley, north of Ventura, produces a great variety of fruits, and is also an important honey district.

How industries in this region are determined by the water supply is shown in the San Fernando Valley. The eastern part is a rich and highly cultivated fruit district, because there water has been easily obtained for irrigation. The western end of the valley has little water of its own for irrigation and was for years devoted chiefly to stock and grain. Now the Los Angeles aqueduct supplies water to this dry region, so that orchards and alfalfa fields and comfortable homes are spreading over it.

The Santa Barbara coastal plain was once beneath the ocean.

If there had been no Santa Barbara coastal plain extending along the base of the Santa Ynez Range, the early explorers would probably not have been able to make their way northward and the story of California would have been different.

We have learned how the shores of California have played seesaw with the ocean. The Plain of Santa Barbara is a strip of rich land which the ocean did not steal when last the coast sank. Like the Plain of Los Angeles, it was formed beneath the water from the mud and sand which the streams brought down from the land.

Although the climate is mild, few oranges are grown there, for they do not thrive in the ocean air. The region is especially suited to the growing of olives and walnuts, and some of the largest orchards in the state are situated there.

Why is Santa Barbara attractive both in winter and summer?

The lofty mountain wall upon the north shuts off the cold winds of winter. Point Conception, extending far out into the ocean, and the islands lying opposite across the channel, aid in making the summer warmer and less foggy than other places on the coast.

The old mission is well preserved and is much visited. There are large tourist hotels and an attractive bathing beach.

Date palm grove at the experiment station, Coachella.

The manner in which Santa Barbara gets its water shows us again how men can overcome Nature. The Santa Ynez River is on the north side of the Santa Ynez Range and flows far away to the west through a thinly settled country. The city needed more water and so it was brought by a tunnel, several miles long, which was dug through the mountains, and now the river serves thousands of people.

In what forms is petroleum found near Santa Barbara?

In the vicinity of Santa Barbara are valuable deposits of a dried out oil which is solid at ordinary temperatures but becomes liquid when heated. This is known as **bitumen** or **asphaltum.** It is quarried, melted down to get rid of the impurities, and shipped for use as street paving material.

At Summerland, oil wells have been drilled out in the edge of the ocean. The tar which is continually washing ashore tells us that somewhere out under the ocean in Santa Barbara Channel are extensive deposits of oil.

Why are the islands off the coast of Southern California so interesting?

A number of islands lie scattered off the coast of Southern California, two of them being nearly sixty miles from the mainland. These islands are interesting because they are the tops of mountains which were once a part of the continent. Between them and the shore the water is quite shallow in most parts and the ocean floor is smooth like the surface of the Los Angeles and Santa Barbara Plains, which were once beneath it. The soundings show that outside of the islands the bottom slopes down rapidly to the depths of the Pacific Ocean.

The islands rise, then, from a submerged part of the continent, as we have already learned (page 200). If people had lived in California when the islands were connected with the mainland, the broad plains which would then have been exposed would not only have afforded a vast area of rich farming land, but would have made travel up and down the coast very much easier than it is now.

An artesian well, Coachella Valley.

Why do so few people live upon these islands?

Many Indians once lived upon the islands, supporting themselves upon fish and molluscs, for the sea about them is full of life. The islands are not suited to farming, for the slopes are generally steep and dry. There are few springs and no trees except a few oaks which grow in the cañons. The main use to which the islands are put is pasturing cattle, sheep and goats.

Santa Catalina Island has become noted as a resort. At Avalon there has grown up one of the most popular seaside resorts. Bathing, boating and fishing are the chief attractions.

Why is the fishing industry of Southern California important?

The catch of the fishermen comes from comparatively shallow water. In the shallow water the fish find their food and a suitable spawning ground.

The large area of shallow water along the coast of Southern California about the islands and reefs favors the growth of immense numbers of fish and the development of an important industry.

A fish preserve has been established about the shores of Santa Catalina Island. Within a distance of three miles from the land, no fish may be taken with a net or set hooks. This is an important spawning ground and it was found that certain fish were in danger of extinction unless they were protected.

Picking cotton, Imperial Valley.

The magic transformation of the Colorado Desert into a land of almost incredible riches.

Nature usually works so slowly that it takes hundreds of years to bring about important changes on the surface of the earth, but in the desert men have wrought a wonderful change almost in a night.

Prospectors who in early days crossed the Colorado Desert from Yuma to San Diego passed over a broad plain where they often suffered greatly from heat and thirst. The dark, rich soil supported only thorny bushes and curious desert animals. Along the ancient desert trail there are now miles upon miles of cultivated lands and many thousands of people.

Those who followed the trail from Yuma to Los Angeles, or who in later years rode in comfortable cars over the same route, passed by a glistening salt marsh occupying a basin of 240 feet below the level of the ocean. During the early part of one summer this salt basin and the desert about it was, in the course of a few months, changed into a lake forty miles in length. How have such sudden changes come about?

The work of the Colorado River.

The Colorado River, when swollen with the water of the melting snows of the far-off Rocky Mountains, is yellow in color and thick with mud. If a quart bottle is filled with the water and allowed to settle, there will appear nearly a quarter of an inch of sediment in the bottom. What has the river done with all this mud which it has been bringing down for many thousands of years?

Long ago the Gulf of California extended north to where the

A natural cactus garden in the Borego Desert west of Imperial Valley.

town of Indio now stands. The mouth of the Colorado River was then near Yuma. Year after year the fine silt or mud which the river brought down was dropped in the gulf until a delta of solid land had been built across it to the Peninsula of California.

The river ran here and there over the delta, continually changing its channel. Sometimes it flowed into the gulf to the south, and sometimes into the lake which the delta had formed by cutting off the northern end of the gulf.

As the years passed, the river emptied less frequently into the lake and its waters began to dry up, leaving at last only a marsh of glistening salt in its lowest part. This was known as the Salton Sink.

The making of Coachella and Imperial Valleys.

The channel by which the water of the Colorado River formerly emptied into the Salton Sink is known as New River. This channel suggested the possibility of irrigating the desert. The soil was believed to be hundreds of feet deep. It was dark and rich and, under the influence of the hot semi-tropic sun, should produce abundantly if water could be had.

A canal was dug from the Colorado River and water was carried over the desert plain. The lands were cleared of brush, plowed and planted. The desert has now become one of the richest regions of California. All the sub-tropic fruits grow here and many of them ripen much earlier than elsewhere because of the early warm spring.

Here there are now thousands of acres of alfalfa, supporting great herds of cattle. There are cotton fields, vineyards and orchards and vast fields of cantaloupes which ripen and are gone before summer comes in the north.

A large part of the desert yet remains to be irrigated. Upon the delta of the Colorado River is growing up a community which in time will rival in wealth those famous people of long ago who dwelt upon the deltas of the Nile and Euphrates Rivers.

The Coachella Valley forms the northern arm of the Colorado Desert, and Indio is its chief town. Here the Arab from North Africa or from Arabia would find himself at home, for his favorite

Mud volcanoes, Imperial Valley.

food is produced in abundance. More than a million date palms have been set out and their fruit equals in every respect the dates from Asia and Africa.

The Story of the Salton Sea.

During a certain year, when the Colorado was very high, the water broke through the head gates of the irrigating canal and flowed in a mighty torrent down the old channel of New River into the Salton Basin. Before the water could be stopped, it had done great damage to the farms along its course and had formed a large lake, covering hundreds of square miles. It flooded the Salton Salt Works and compelled the railroad to move its tracks to higher ground. The water also covered some interesting mud volcanoes in the midst of the desert.

Far above the present lake, on the borders of the mountains, is an old beach and wave-cut cliff made long ago. Fresh-water shells can still be picked up along this old beach.

Salton Sea will finally dry up and the salt marsh will reappear unless the river breaks in again.

SUMMARY.

Southern California is a land of mountains and valleys. It has many sorts of climate and for that reason a great variety of productions.

The valleys receive a light rainfall and could never have become thickly settled if it had not been for the mountains on which the rains and snows are heavy.

In no other part of our country are there such wonderful contrasts. Snow-covered mountains look down upon blossoming orange groves, and forbidding deserts surround gardens of almost tropical luxuriance.

Southern California was little influenced by the gold excitement and its settlement was slow for many years.

As soon as the railroads were built into this region so that it could be reached easily, and people had discovered what a mild and healthful climate it had, settlers and visitors began to come by the thousands.

Irrigation systems were built and soon the dry slopes began to be covered with orchards of every description.

Southern California is most noted for its climate, its scenery, its navel oranges, its cotton and cantaloupe fields. To these must soon be added dates, which are becoming one of its important products.

Los Angeles, because of its favorable situation, has become the metropolis of the south and one of the two largest cities of the state.

REVIEW EXERCISES.

Why is Southern California difficult to study?

What barriers separate Southern from Central California? What barriers separate it from the East?

Trace on the map the watershed. Where is the coastal slope the widest?

Draw a line about the basins of the Santa Ana and Santa Clara Rivers and tell which is the largest.

What is the reason for the largest rivers being on the coastal slope?

Why was this region once believed to be of little value for farming?

In what way have the mountains made it possible for Southern California to support a great population?

How does the mountain climate differ from that of the coast? How does it differ from that of the interior valleys? Which do you prefer?

Tell the important products of each of the three regions just mentioned.

Why was Southern California little affected by the early mining excitement?

Why did so few of the emigrants come by the southern routes?

Point out the leading mountain passes and tell what roads go through each.

What are the advantages of irrigation? Are there any parts of the South where it is not needed? How does the careful cultivation of the soil affect the need of irrigation?

Mention any farm products that can be grown in the valleys without irrigation.

What sort of a place is selected for a reservoir?

What becomes of the rain and snow that fall upon the mountains?

Describe some of the different ways of watering the orchards and vineyards.

Mention some of the things which do best upon the river bottoms. Where are the best oranges raised?

What is the result of cutting the forests from the mountains?

If you owned a ranch in the San Bernardino Valley, would you object to the lumbering of the mountains above?

If your home is in Southern California, describe the effects of any earthquakes that you have felt.

Why are many fruits later in ripening than in Northern California?

Find out what is meant by "dry farming."

Why do so few people live in the San Gabriel Mountains?

Describe the climate needed by each of the following: sugar beets, beans, oranges, lemons, raisin grapes, apples and cherries.

What are the advantages in the situation of Los Angeles?

What are the advantages and disadvantages of San Diego?

How did Los Angeles obtain a good harbor?

Describe the occupations in different parts of the region between Los Angeles and Santa Barbara.

Point out upon a map the lines of travel between Southern and Central California.

How does the supply of water in different places affect the kind of farming carried on?

In what part are the best oranges grown?

Why is it so dangerous to get lost in the Colorado Desert?

Where did the salt come from that was in the Salton Sink before the great lake was formed?

Mention some of the chief productions of Imperial Valley, with reasons.

What is the most important crop of the Coachella Valley?

Why was the railroad between Imperial Valley and San Diego so long in building although the distance is not great?

Why was it at first thought there was little fertile land about San Diego?

What are the particular attractions of San Diego?

How do we know that the level of the land along the coast has changed?

Why was San Diego Mission placed in Mission Valley, some miles from the coast, rather than on the bay?

What advantage is it to San Diego to have a railroad built east across the mountains to Yuma?

Describe the attractions of Avalon on Santa Catalina Island.

Why is it necessary to establish fish preserves, since the ocean is so large?

How do we know the islands were once a part of the mainland?

If the land should sink 1200 feet to a point where it was once, what would the effect on the islands be? What would become of fruit growing in Southern California?

Why has fruit growing developed more than manufacturing in Southern California?

How has the discovery of large quantities of petroleum affected manufacturing?

Tell anything that you know about the tar springs near Los Angeles and how they trapped the animals and birds long ago.

Mention the chief attractions which have called people to Southern California.

PRACTICAL LESSONS.

Many a country which has been left by Nature apparently dry and barren has been transformed by men into a luxuriant garden.

Valleys lying on the side of mountains from which moist winds blow are better watered than they would be if there were no mountains, while those on the opposite side are drier.

Mountains protect a country from invasion by an enemy, but at the same time they stand in the way of people of that country shipping their products to market.

Mountains and deserts once offered serious obstacles to the settlement of a country, but now we are able to carry water into the deserts and to tunnel through mountains.

No country can become rich and prosperous without a market for its products.

Not all mountains contain minerals, but there are few found in those countries where there are no mountains.

Men can lead water into a dry country and can drain one that is marshy, but they cannot change the winds or the rainfall or the temperature.

It is very necessary to take good care of the mountain slopes in countries where the rainfall is light, and not permit fires, or cattle, or lumbermen to injure them.

A mountainous country has a much greater variety of productions than a level one.

Each kind of plant, vegetable or fruit, requires the sort of climate to which it has become accustomed. We cannot be successful in raising dates in any but the hottest valleys of the desert, for their climate is like that of the home of the date in North Africa.

A coastal region over which the winds blow from the ocean has a much more mild and even climate than it would have if the winds blew from the land.

The situations of great cities are determined by Nature and not by men.

The occupation of people is determined by the climate, the soil, the steepness of the slopes, and the markets.

Milk goat industry. A typical picture of the pure bred Swiss Toggenberg goat, Las Cabritas Montara. This is a new and rapidly developing industry in California.

The Desert Transformed—Imperial Valley

CHAPTER VIII.

The Great Basin: That Land from Which No Water Ever Flows to the Ocean—Whose Vast Deserts the Pioneers Had to Cross Before They Could Reach the Land of Gold.

What sort of country did Fremont discover in the interior of our continent?

General Fremont, while carrying on his explorations in that vast unknown land west of the Rocky Mountains, discovered a strange region.

This region lay between the Wasatch Range of Utah and the Sierra Nevadas of California. It has on the south the Colorado River with its deep cañon and on the north the Snake River, also flowing in a deep cañon.

Fremont found this region to be different from any which had ever before been known on our continent; it was extremely dry and inhabited by curious animals and plants. The strangest thing about this region was that it appeared to be entirely surrounded by a rim of higher land, so that none of the rainwater that fell upon its surface could flow away to the ocean. Because of this he named it the Great Basin.

We must understand, however, that the Great Basin is not one large desert waste, but consists of many small ones with mountain ranges between them. In some of these basins there are lakes with water so salty and alkaline that nothing can live in it, while in others there are dry clay beds where lakes have once been.

Why was this region so difficult to cross in the early days?

Water to drink and forage for animals are difficult to find upon the desert. In summer the rays of the sun beat down fiercely upon the almost barren ground, while in winter cold winds sweep over the surface.

The springs are often so far apart and hidden in such out-of-the-way places that sufficient water has to be carried to last several days. Sometimes the desert traveler thinks he sees the water of a lake overhung with trees and leaves the trail to slake his thirst and fill his canteen, but this is only the desert "**mirage**" and it lures him on to his death.

For the pioneers there was, then, in addition to the danger of attack from Indians, the farther danger of death from thirst. Many of the thousands of ox-wagons that entered the desert never succeeded in crossing it, and abandoned wagons and the bones of oxen and horses were strewn along the route.

How came this region to be a basin?

Our geographies speak of river basins, but they are not true basins. They are open at one side and thus permit the rains which fall upon the other sides to unite in one main stream or river and flow away.

The region which Fremont called the Great Basin is a true basin, for it has a rim all around it, like a plate or saucer. Each of the many small desert basins or valleys has a rim of its own, but outside of all is the great rim.

This strange land exists here because at no time since its valleys and mountains were formed has there been rain enough to form river systems such as we find in other parts of our country.

If it should rain there as much as it does at San Francisco, very soon every desert basin would be full of water. The higher basins would overflow into the lower, and when the water had reached the lowest ones and filled them, it would run over the lowest points in the outer rim of the Great Basin and flow away to join either the Colorado or Snake Rivers.

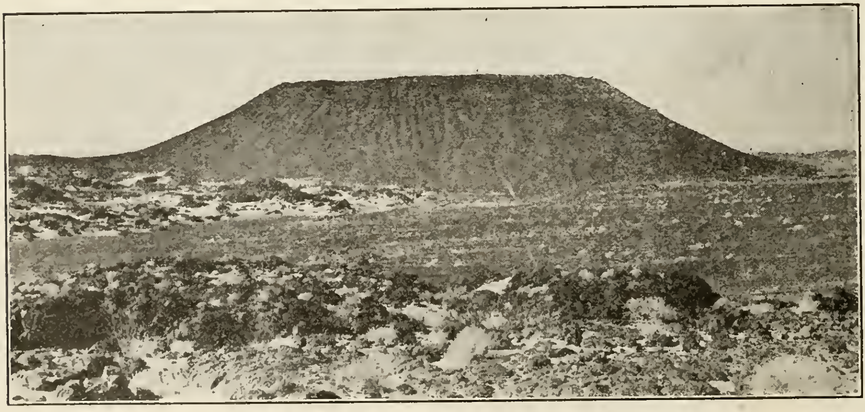
There would thus be formed many lakes throughout the Great Basin. After a time, as the streams which ran out of them wore away their channels and made them deeper, the lakes would be drained. You can see how this would be from the behavior of the little pond when it has overflowed the dam that you made to hold it.

At one time long ago, when there was more rain than there is now, some of the lakes in this desert region did overflow. Great Salt Lake was then an immense lake, much larger than it is now, and it overflowed its basin and emptied into the Snake River in Idaho.

Owens Lake overflowed, and a large river ran south along the base of the Sierra Nevada Mountains and emptied into a lower basin in the Mohave Desert. Here a lake was formed which has now dried up. Its bed is known as Searls Borax Marsh and is filled with valuable deposits of soda, borax and potash.

What has made a desert of the Great Basin?

We have already learned something of how the cool summits of the lofty mountains aid in changing the moisture of the clouds



A volcanic crater in the Mohave Desert.

into rain or snow. We have learned also that the storms usually come from a westerly direction and that the Coast Ranges and the still loftier Sierra Nevadas lie across their paths and take away most of the moisture of the clouds before they let them go.

The three things which we have mentioned all work together to make a desert of the Great Basin. So little moisture remains in the air after it has passed the Sierra Nevadas that the Inyo-White Mountain Range, which is in places almost as high as the Sierras, receives but little rain and snow. East of these mountains in Nevada it is drier still.

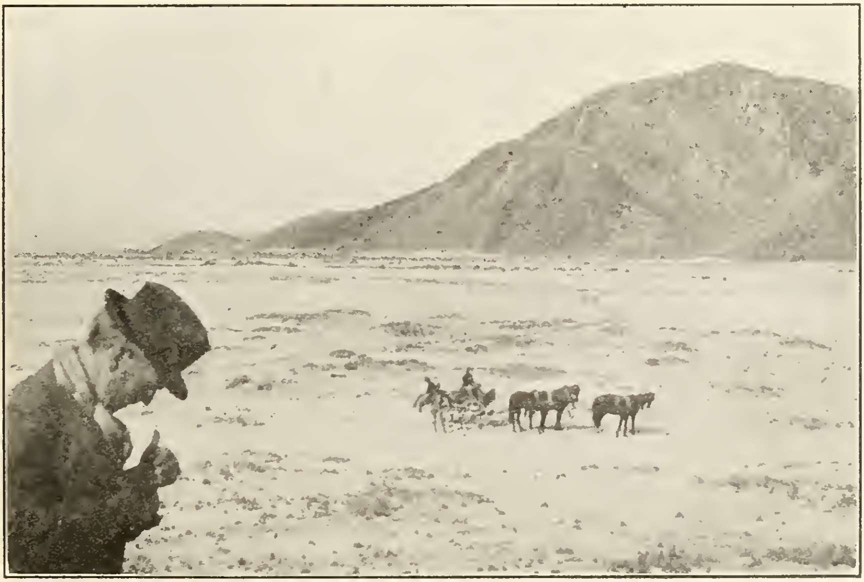
These things lead us to suspect what is really the case, and that is, that the lowest valleys of the Great Basin which lie behind these mountains, the highest in our country, form the hottest, driest and most dangerous of deserts. Thus Death Valley, below the level of the ocean, is the most dreaded of all.

How is it that there are lakes in this desert region?

Where there are lakes there must be streams to supply them with water, and the streams must take their rise where it rains or snows. How, then, can we account for lakes in the desert?

A study of the map will show that all the lakes of the Great Basin lie near its borders, and that the streams which feed them rise in the high mountains on the rim of the basin. Thus Great Salt Lake on the eastern border of the basin receives its water from the Wasatch Range.

Honey, Mono and Owens Lakes lie close to the western rim



The white salt and soda flats of Death Valley.

and within the boundaries of California. They receive their water from the melting snows of the Sierra Nevadas. Walker and Pyramid Lakes in Western Nevada also receive their supply from the Sierras, but the streams which feed them have to flow farther before they find a basin in which to stop.

Beautiful Lake Tahoe, although high in the Sierra Nevada Mountains, is really in the Great Basin. The water which flows from it forms the Truckee River, which, after irrigating thousands of acres of desert land, finally reaches Pyramid Lake.

Why are the lakes of the Great Basin so salty and alkaline?

If you will visit one of these lakes and taste the water, you will find it very nauseating. It is a disagreeable mixture of salt, soda and other mineral substances. The water leaves a white, crusty deposit around the shores when it evaporates, and is so dense that one cannot sink in it.

These lakes, like the ocean, have no outlet. Year after year the streams dissolve tiny particles of mineral substances from the rocks and carry them to the lakes. Mineral springs also aid in this work. No water ever flows away and that which evaporates into the air cannot take the mineral substances with it. In this way the waters of these lakes gradually become filled with salts of various kinds.

How are plants and animals able to live in this dry region?

We must not think that our deserts are entirely without rain and that they are covered with bare rocks and sand like the Sahara in North Africa.

Some rain falls in the deserts of California and they are alive with many sorts of plants and animals which, through many thousands of years, have become accustomed to doing with little water.

Many plants, such as the different kinds of cactus, are armed with thorns. Others have very small leaves and are covered with a resinous bark to keep them from losing the little moisture which they are able to get from the earth.

Strange and interesting animals live in the desert. There is the tortoise, which can go many months, and perhaps years, without finding water, because of sacks in its body for holding a supply. There is the horned toad with his spiny covering, the great lizard called the Chuckawalla which the Indians eat, and many slender lizards of bright color that race like a flash over the sand, and last, the "side-winder," one of the most dangerous of rattlesnakes.

It sometimes happens that there are spring rains in the desert. Its slopes are then quickly covered, as if by magic, with a carpet of many kinds of beautiful flowers. These flowers mature their seeds quickly and die. Soon all signs of their presence are swept away by the winds and drifting sands.

The vegetation is not the same all over the desert.

There are belts of vegetation upon the desert just as upon the mountains, for it rains more in some places than in others, and is hotter in some than in others.

Along the dry water courses in the Colorado and Mohave Deserts, we find the **mesquite**, a small, thorny tree bearing pods with edible beans.

The most widespread plant upon the open desert is the **Mexican creosote** bush, which has a resinous sap.

The **Washington palm**, seen so often in our gardens, grows in the cañons along the western border of the Colorado Desert. Beautiful **cactuses** of various kinds abound and, in the region mentioned, form most wondrous natural gardens.

Upon the Mohave Desert are vast groves of the giant **yucca**, among which grow cactuses, creosote bush and other plants.

Higher up the slopes, where there is a little more rain, we come upon the **desert juniper**. Above this, on the higher mountains, we see the **pinon pine.**

Along the eastern base of the Sierra Nevadas and extending far northward, the sagebrush is the chief desert plant and often grows to a great size.

How much of California lies within the Great Basin?

If we begin in Northeastern California and draw a line along the summits of the mountains dividing the sources of the rivers which flow westerly into the ocean from those which flow easterly and sink in the Great Basin, we shall find by the time we have reached the southern part of the state that we have cut off about one-third of its area. It will be noticed that the line is very irregular and that between Central and Southern California it extends west almost to the ocean.

However, not all of the land included in the Great Basin is desert, for along the base of the rim of mountains which we have traced there are large areas of land where there is a moderate rainfall and water for irrigation.

Sand dunes of the Colorado Desert.

What calls people to the desert and how are they able to live there?

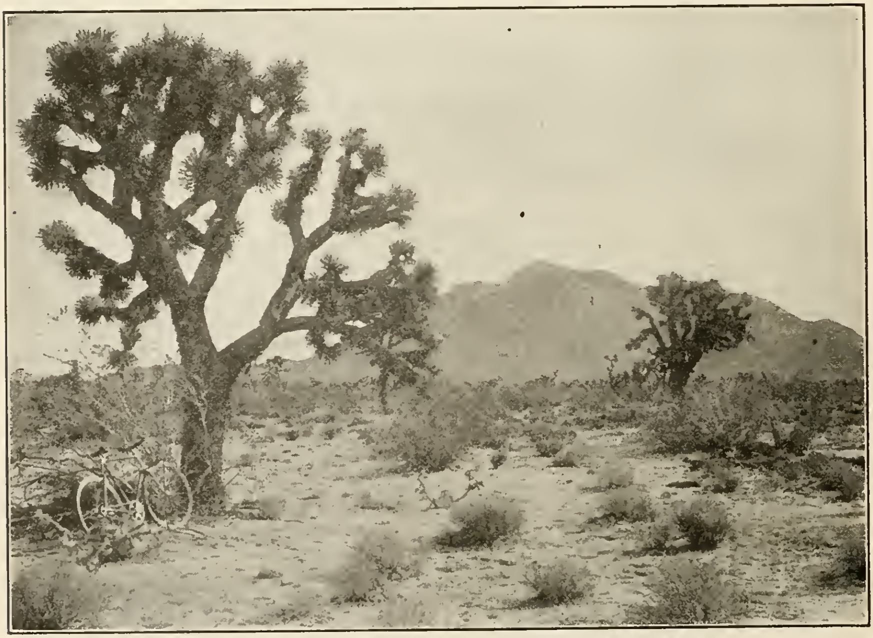
The search for gold takes people to the desert. The prospector with his burros, his food and water kegs goes all through the barren land. Nearly all the mountains contain veins of gold and silver and lead, and in some places zinc. Because of the lack of water many of these veins cannot be worked. If the mines appear to be very valuable, water is sometimes piped to them from distant springs.

The Virginia City mines, in the edge of Nevada, and the Bodie mines in California, are the most noted ones in the western part of the Great Basin. At Virginia City there are springs of hot and almost boiling water, which makes the workings of the mines difficult at great depths.

In some of the large basins of the Mohave Desert which were once filled with lakes there are valuable deposits of soda, borax, salt and gypsum. Rock salt as clear as glass is obtained from the Danby Salt Marsh. At this place there is a curious cabin built of blocks of salt.

The Searls Borax Marsh, which is the bed of an ancient lake, contains the most valuable deposits of borax known in the world. For years the borax was hauled across the desert to the town ot Mohave in a wagon train drawn by twenty mules.

Soda has been obtained from the water of Owens Lake by running it into ponds and allowing it to evaporate. The soda settles



Yucca and creosote bushes in the Mohave Desert.

to the bottom and is shoveled out before the water has evaporated enough to make the salt separate.

In Death Valley there are also beds of salt and soda, but it is difficult to work them during the heat of summer. In the middle of the day in summer it is hardly safe to attempt to cross the glistening marshes, so great is the heat.

How is it that stock raising can be an important industry in the desert?

Upon the mountains of the central and northern parts of the Great Basin there is rainfall enough to grow the nutritious bunch grass, but not enough for farming. In those parts the raising of horses, cattle and sheep is an important industry. Many thousands of sheep are pastured in places where there is not water or forage for cattle.

Stock raising is also important in Surprise, Honey, Owens, Mono and Antelope Valleys, where there is water for irrigation, for there alfalfa furnishes a cheap forage.

To what extent can farming be carried on in the desert?

The soil of much of the desert is fertile, but only those parts can be cultivated where water is to be had for irrigation.

Imperial Valley has an abundance of water brought from the Colorado River. Coachella Valley, lying to the northwest, obtains its water from artesian wells.

That part of the Mohave Desert lying against the north slope of the Sierra Madre Mountains is called Antelope Valley. In this valley are raised grain, almonds, alfalfa, apples. The water for irrigation is obtained partly from the mountains and partly from artesian wells.

Many fertile valleys are found along the eastern base of the Sierra Nevada Mountains. They are supplied with water from the

Grazing sheep in the desert.

melting snows upon the mountains. Owens Valley is the largest of these. It is devoted largely to the raising of cattle and alfalfa, but is becoming noted also for its fruits, especially apples.

About Mono Lake are cattle ranches with their irrigated meadows. Hardy vegetables can be grown there, but as the region is over 6000 feet it is too frosty for fruit.

Carson and Walker Valleys, still farther north, are chiefly given over to cattle raising, although apples can be grown in them.

The Truckee River is the largest river flowing into the Great Basin. It rises in Lake Tahoe in California, but its waters are used chiefly in Nevada, where they irrigate many thousands of acres.

Honey Lake Valley, close under the northern Sierra Nevadas, is noted for its apples, hay and cattle.

In far Northeastern California, at the eastern base of the Warner Range, lies Surprise Valley, a rich and highly cultivated region with an abundance of water for irrigation. Fruit and all kinds of farm produce are raised there.

What has determined the route of the roads and trails through the desert?

If you had to cross the desert either with a team, on horseback or on foot, would not your first question be as to where the springs and water holes are?

As the springs are so far apart, you would have to direct your course so as to reach water as frequently as possible. This might make a very crooked road or trail, but every one would have to

The rugged surface of a recently cooled stream of lava in Northern California.

follow it if he valued his life. We can say, then, that the position of the springs is the first and most important thing determining the routes of travel on the desert.

The wonderful extinct volcanoes of Eastern California.

We have learned that along the eastern base of the Sierra Nevada Mountains there is a line of fissures in the earth where the broken rocks when they slip give rise to earthquakes.

Through these cracks which extend far down into the interior of the earth came molten rock once upon a time. This spread far over the surface forming lava fields when it flowed out quietly.

When the lava was hurled out violently like the shot out of a gun craters were formed, some of which grew to be mountains.

If we make an exception of Cinder Cone, near Mt. Lassen, there are no other craters in California so fresh and perfect as those south of Mono Lake known as the Mono Craters.

Fierce eruptions from a number of craters spread fine ashes over miles of country. After the ashes came streams of molten lava which piled almost mountain high. Some of the lava cooled so quickly that it formed glass. This volcanic glass or **obsidian** was used by the Indians for arrow and spear points. In one of the craters we can see their ancient quarries.

The islands in Mono Lake are worthy of a visit. They have been almost shaken to pieces by earthquakes and volcanic eruptions. Here there are hot springs, steaming rocks and some very interesting craters.

SUMMARY.

That part of our continent lying between the Wasatch Mountains and the Sierra Nevadas is occupied by a vast desert which, because it has a rim of higher land all about it is called the Great Basin.

The Great Basin is of much interest to us because about one-third of the area of California is included within it although the number of people living there is small. It is also interesting because there occurs there the driest, hottest and lowest land in the United States.

The driest part of the Great Basin is not without some rain and so we find many animals and plants scattered through it. Some of these have taken on strange and curious forms in their struggle to live with little water.

Mining is an important industry, and wherever there is sufficient rain to grow grasses there are cattle, horses and sheep.

The high mountains upon the eastern and western borders of the Great Basin supply water for irrigating thousands of acres of land, and in some of the valleys which nestle under them there are rich and prosperous settlements.

REVIEW EXERCISES.

Trace on the map the boundaries of the Great Basin.

Point out the routes of the emigrants across the desert.

How does the Great Basin differ from a river basin?

What would happen if the climate should change and become wet?

Why is there so little rain in this region?

Why are the desert valleys so hot in summer?

What kind of an outfit would you buy for a journey across the desert?

How is it that salt, soda and borax are found in the desert and not in the wetter parts of California? For what are these substances used?

Why are the desert lakes salty and those in other parts of California fresh?

Describe any desert plants that you have seen.

What advantage have the animals of the desert over the plants?

The cabin of rock salt in the Danby Salt Marsh has stood many years. What sort of a climate does this indicate?

Point out parts of the desert where farming is carried on and give reasons.

Why is life in the desert most of the year very pleasant?

Find out what you can about the cloudbursts that occur in the desert. Why are they so dangerous to railroads?

The giant sage brush of Honey Lake Valley shows the desert soil is rich.

What can we learn from the earthquakes in Owens Valley about the making of the Sierra Nevadas?

Find out all that you can about Mono Lake and the Mono Craters.

Point out parts where it is too dry for farming and give your reasons.

PRACTICAL LESSONS.

A region shut off from the ocean by lofty mountains is likely to be desert and also to be very hot in the summer.

All lakes without outlets are alkaline and salty, and those with outlets are fresh.

In no part of the earth has the climate always remained the same. Animals and plants become adapted through many generations to slow changes of climate. If the changes in climate came quickly they would be killed.

The Indians could not live where Nature had neglected to leave any water. Civilized men can take water into the heart of the worst of deserts and turn it into fruitful gardens.

Deserts add to the difficulty of traveling and seem at first thought to be just so much waste land, but they supply many minerals which are not found elsewhere.

A glimpse of Westlake Park, Los Angeles.

CHAPTER IX.

The Klamath Mountains: Whose Steep Slopes and Narrow Cañons for Many Years Interfered With Travel Between California and Oregon.

Where are the Klamath Mountains and what are their boundaries?

The extreme northern part of California is occupied by two of the seven districts or provinces into which we have divided the state. Although these two districts lie side by side the character of their slopes and the main occupations of their inhabitants are quite unlike.

The district including the northwest corner we shall study first. It is called the **Klamath Mountains.** It has few large valleys, its slopes are generally steep and the people are largely engaged in mining.

The other district forming the northeast corner we call the **Volcanic Plateau.** It is formed of broad upland valleys with scattered mountains and its inhabitants are mostly engaged in farming and stock raising.

The Klamath Mountains lie north of the Coast Ranges. The Volcanic Plateau lies north of the Sierra Nevadas. The two together close in the northern end of the Sacramento Valley. They meet in an irregular line extending in a northerly direction, from a point a little east of Redding, west of Mount Shasta and through Shasta Valley.

What is the character of the Klamath Mountains?

The Klamath Mountains are higher and more rugged than the Coast Ranges and have many deep cañons. They are formed of rocks which hold veins of gold and copper like those of the Sierra Nevadas.

If we could look down upon this region as a bird does we should see that it is formed of a group of many different ranges, each range bearing a different name. Beginning at the south we have the **Hay Fork, Trinity, Salmon, Scott** and **Siskiyou** mountains.

The Salmon Range is the highest and most rugged, several peaks rising over 9000 feet. The heavy snows which fall there, the small glaciers, glacial lakes, alpine forests and picturesque crags all remind one of the High Sierras.

How is this region watered?

The Klamath River, one of the largest streams of California, flows through the heart of the Klamath Mountains. It rises far away east of the Cascade Range in Oregon. Its waters have been put to less use than any other of our California rivers for the most of its course is in a cañon through a rough and thinly settled country.

There is no harbor at the mouth of the river and the opening which it has made through the mountains is not in such a direction that it is convenient to use it as a highway of travel.

The Sacramento is, on the countrary, a very useful river. It rises in great springs near the base of Mt. Shasta upon the edge of the Volcanic Plateau and flows in a deep cañon through the eastern part of the Klamath Mountains.

This cañon offers a direct route through the mountains to Oregon and is used by the Southern Pacific Railroad. It is, however, so rough and difficult to traverse with wagons that the first road was built by another route over the Trinity and Scott Mountains. The roughness of the Sacramento River cañon is due in part to a flow of lava which came from Mt. Shasta and followed the cañon nearly to Redding.

The Trinity is the largest river which rises in the Klamath Mountains. There are some valley lands along its course but the chief use to which its waters have been put is hydraulic and placer mining.

Why were there no trails opened across these mountains in pioneer days?

Between the Willamette Valley of Oregon and the Sacramento Valley of California there lies a rough and wild country. The Klamath Mountain region which we are now studying forms only a part of this rough country. In addition to the difficulties of travel which were great there was the danger of attack from the Klamath and other Indians who were very numerous.

The beautiful and fertile Scott Valley in the Klamath Mountains.

Because of the obstacles mentioned the Gold Seekers who came through Oregon took a round-about way farther east across the Volcanic Plateau. Although the surface of the country on this route was very rough in places, there were few cañons or steep mountain slopes and the Indians were less feared.

What led to the early settlement of the Klamath Mountains?

It was the search for gold that first led people into this remote and rugged region. The miners traced the golden sands northward along the foothills of the Sierras. When they reached the upper end of the Sacramento Valley a new land of riches opened to them, for all the streams coming from the Klamath Mountains were found to be rich in gold.

No mountains were too steep nor cañons too rocky when gold lay ahead and soon thousands of people spread all through this region and towns sprang up at the rich bars. A wagon road was built over the Trinity Mountains from the Sacramento Valley to Weaverville, then up the Trinity River and finally across the Scott Mountains. The road ended at Yreka, a rich camp. Most of the camps were, however, reached only by long steep trails over which everything had to be packed on horse or mule back.

When the gravels in the beds of the present streams ceased to pay the miners began to work the gravels of the ancient streams, portions of which remained in the form of benches along the sides of the cañons.

These gravels were many feet thick and to get at the gold in the bottom they used the same means as in the foothills of the Sierra Nevadas. Water was brought in ditches around the hillsides

A beautiful glacial lake in the Klamath Mountains.

until it was above the ground which was to be worked. From there it was carried down in pipes and directed against the gravel bank by means of a "giant." Thus hydraulic mining was begun and it continued to be an important industry for many years. In places this form of mining is still carried on.

Veins of gold-bearing quartz were discovered when the placer mines began to fail but it required comparatively few men to work them and the most of the population drifted away.

In what parts of the Klamath Mountains is mining now carried on?

As we travel along the Sacramento River above Redding or through the cañons of the Klamath, Trinity and Salmon Rivers we see great piles of boulders and gravel which have been worked over by the miners, and occasionally the ruins of once flourishing camps. Huge gravel banks remain where there was too little gold, and in a few places we find the miners still at work with a "giant" through which a six-inch stream of water is being thrown with terrific force against a high bank of gravel.

The gold quartz mines are mostly upon the mountain slopes above the old placer mines. They are scattered all through the Siskiyou, Scott and Trinity Mountains.

Great deposits of copper ore have been worked near Kennet on the Sacramento River, and at Copper City on Squaw Creek, and smelters have been built to extract the metallic copper from the ore. The water which flows from these mines contains so much copper in solution that if pieces of iron are placed in it they soon become coated with deposits of bright metallic copper.

Valuable deposits of iron ore exist near Pitt River northeast of Redding.

Is there much farming in the Klamath Mountain region?

Although most of the Klamath Mountain region is not suited to cultivation there are a number of valleys of considerable extent.

Shasta Valley lies on the boundary between the Klamath Mountains and the Volcanic Plateau. This is a rich farming district. Dairying and the raising of cattle and hay are the chief industries. The climate is especially suited to the growing of apples for which the valley has long been noted. Because of the high mountains between it and the ocean the climate of the valley is rather dry and irrigation is practiced wherever water is to be had.

Yreka is the largest town in this part of California. It was once noted as a mining camp but is now chiefly supported by farming and stock raising.

Scott Valley lies to the west of Shasta Valley wholly within the Klamath Mountains, and hence has a moister climate. It is an attractive and fertile region where dairying, raising of hay, grain and cattle are carried on. Like Shasta Valley it produces the best of apples.

The **Valley of the Trinity River** of which Weaverville is the chief place was once filled with miners, but general farming and stock raising are now the chief industries. Although the climate is suited to the growing of many kinds of fruit the distance to market is so great that only enough for home use is produced.

Hay Fork Valley lies in the extreme southern portion of the Klamath Mountains and is devoted chiefly to stock raising.

About **Crescent City,** the most northern town upon the coast of California, there are rich lowlands partly cleared and devoted to dairying. The only outlet for produce is by steamer for, although one road leads south to Eureka and another north to Oregon, the distance to market is so great as to make them of no value commercially.

Why does the interior of the Klamath Mountains contain so few people?

Aside from the farming and mining districts which we have mentioned the Klamath Mountains are almost uninhabited by white people. There still remain a few Indians. No roads lead into the heart of this rough region and the miners scattered along the rivers pack their supplies over rough mountain trails.

Hydraulic mining on the Klamath River.

The mountain slopes which are level enough for farming have a cold winter climate and are generally covered with forests. There is no sale for timber or for farm produce. Consequently stock raising is, next to mining, the most important industry.

The Klamath Mountain region contains a number of attractive valleys which can support many more people than now occupy them. Since the early mining days it has remained in the present backward, and undeveloped condition because of the lack of roads and railroads and the great distance to market.

What is the nature of the forests of the Klamath Mountains?

The forests contain trees found in both the Coast Ranges and the Sierra Nevadas. The most important tree of the lowlands near the ocean is the redwood. As we go up the mountains we find the spruce and yellow pine and scattered among them oaks of different kinds.

Upon some of the dry warm cañon sides are digger pines which belong far to the south, and, perhaps most interesting of all, there is the Spanish bayonet whose natural home is upon the borders of the deserts of Southern California.

Higher on the mountains there is the white fir, sugar pine, cedar and white pine, the latter near the timber line. Upon the northern slopes of the higher ridges there are forests of alpine hemlock, and in some places patches of huckleberries.

Why is the lumber industry of little importance at present?

The forests of the Klamath Mountains possess great value, but because transportation is so poor they have been cut chiefly upon the eastern and western borders.

Crescent City is the most important shipping point for lumber, redwood being the chief product. Along the upper Sacramento River are mills which have cut the timber from adjacent slopes.

The larger part of the forested mountains is now included in the National Forests. The timber will not be cut until it is really needed and then without the waste which most lumber companies permit.

The Sacramento River Cañon attracts many summer visitors.

The Sacramento River cañon is important in many ways. In the first place it opens a way through the mountains from the Sacramento to Shasta valleys enabling us to reach a part of the state which would otherwise be difficult to get at.

In the second place it offers many attractions as a summer camp ground. The upper part of the Sacramento River cañon is remarkable for the many mineral springs of both sulphur and soda water. The most noted are Shasta Springs at which all passenger trains stop permitting the travelers to drink the pleasant sparkling water.

The springs, together with the agreeable summer climate, the magnificent scenery of Castle Crags and Mt. Shasta attract thousands of visitors every summer to the cañon and to Strawberry Valley at its head.

In what way does the McCloud River differ from ordinary rivers?

The McCloud River has a small watershed but a large volume of water. It has no branches of any consequence and is almost as high in the late summer as it is in the spring.

This strange behavior is due to the fact that it is fed mostly by springs, we might almost call them rivers, which come underground from Mt. Shasta. These springs are supplied by water from the melting snow and glaciers on the mountain and the water flows under the lava and breaks out in the side of the cañon of the McCloud river.

The water is clear and cold throughout the year and for that reason the Government has located an important fish hatchery upon it.

SUMMARY.

The northwest corner of California is occupied by a group of mountain ranges all taken together being known as the Klamath Mountains. They are loftier and more rugged than the Coast Ranges to the south, and have steeper slopes and deeper cañons than the Volcanic Plateau to the east.

The discovery of gold first led to the settlement of this region, but with the working out of the placers most of the people moved away.

There are a number of fertile valleys but the greater part of the region is unsuited to anything but lumbering and mining.

The mining is now confined to gold quartz mining and hydraulic mining. The valuable forests have been lumbered only along the borders of the district.

Owing to the general roughness of the region and the distance to market it remains thinly settled and in a backward condition.

REVIEW EXERCISES.

According to the relief map the Klamath Mountains appear to be a northward extension of the Coast Ranges. Why, then, do we call them by a different name?

How do these mountains resemble the Sierra Nevadas?

Why is the Klamath River of so little use to the inhabitants of the region?

Point out the route of the first wagon road from the Sacramento Valley to Yreka. Why did it not go up the Sacramento River cañon?

What kinds of mining are now carried on? Which is the most permanent kind of mining: placer, hydraulic or quartz mining? Give your reasons?

Point out the chief valleys in which farming is carried on. Is fruit growing important? What disadvantages do the farmers labor under?

What attractions are offered by the Sacramento River cañon?

Explain why the McCloud River has such an even flow throughout the year.

Tell what you can about the lumber industry. What are the chief varieties of trees found in the Klamath Mountains?

PRACTICAL LESSONS.

River cañons to be useful as highways of travel through mountains must extend in the direction in which people wish to go, thus connecting one centre of business with another. (Compare in this connection the cañons of the Klamath and Sacramento Rivers.)

The settlements and industries of a mining country are less permanent than those of an agricultural country.

A country may have many natural resources and yet be so far from market that they cannot be developed.

The occupations which people carry on in any country are determined by Nature.

Any mountain region which is rich in attractions as summer camp grounds should be preserved in its wild state with the greatest care.

The Klamath River in the Klamath Mountains—a stream which runs away to the ocean unused.

CHAPTER X.

The Volcanic Plateau: An Elevated Region of Broad, Plain-Like Valleys, Lava Fields and Extinct Volcanoes.

Volcanoes have had much to do with the making of California.

Volcanoes and lava eruptions occur, as we know, where there are cracks in the earth formed by the making of mountains or the sinking of land.

California is a country of many mountain ranges, some of which are still growing as we can tell by the earthquakes, as well as a country of many volcanoes.

If we should travel over California we would find extinct volcanoes in nearly every part, but it is only in the northeastern corner that volcanoes and lava flows are so numerous as to change the whole appearance of the country.

Long ago Northeastern California, instead of being a mountainous plateau as it is at present, was a lowland of marshes and lakes.

If we had been there in those days we could have traveled from the Sacramento Valley northeastward into Oregon without meeting any mountains. There was then no Mt. Lassen or Mt. Shasta.

The map shows us that now there is a continuous chain of mountains reaching from the Sierra Nevadas to the Klamath Mountains completely inclosing the Sacramento Valley. How did this great change come about?

The building of the Volcanic Plateau.

There came a time ever so long ago when fissures opened in the earth over a great extent of country now forming the northwestern portion of the United States. This region extended into what is now northeastern California. From these fissures came lava which spread out in vast thin sheets and cooled with a rough, jagged surface.

From certain places in these fissures the lava was hurled out with explosions. Some of it was in the form of fine ashes or pumice, some of it was in the form of cinders or scoria, while occasionally great masses many feet in diameter were thrown out.

We call these places where the explosions occurred **craters.** The lava which was blown out and accumulated about them formed **cinder cones,** and after a time if the explosions continued long enough the cinder cones grew into mountains.

The eruptions took place here and there for hundreds of thousands of years. There were times when the earth was as quiet as it is today in this region. During these quiet times forests spread over the country. Lakes filled the hollows of the lava and birds and animals, different from any living there today, occupied the country, as we can tell by the bones that are in some places dug out of the rocks.

At last so much lava accumulated that it formed the plateau which we are now studying. The lava is, in places, more than a half mile deep, and not only covers all northeastern California but much of Oregon, Idaho and Washington. It is one of the greatest fields of lava in all the world.

What has led us to believe that the volcanoes of Northeastern California are not dead but only sleeping?

There are many places upon the plateau where there are hot or boiling springs. Hot Spring Valley, a few miles east of Lassen Peak, is a most interesting region of this kind. Here there are many hot springs. At one point is a boiling steaming .lake; at another place there are curious mud volcanoes where jets of steam have brought up mud from the softened rocks.

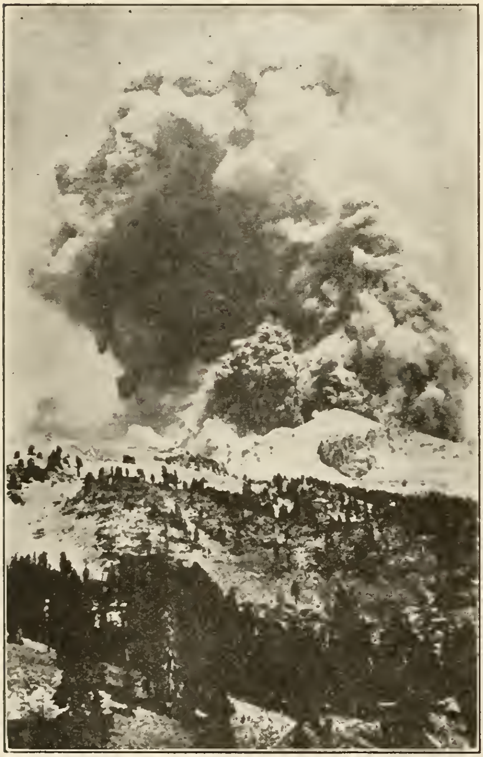
These things lead us to believe that not far below the surface the earth is very hot and perhaps molten.

The recent eruptions of Mt. Lassen show that the volcanoes of this region are not all dead.

In Pioneer Days Peter Lassen opened a trail from Oregon across the Volcanic Plateau and near a great volcanic mountain. His name was given to this peak which has an elevation of 10,577 feet and marks the southern end of the Cascade Range.

In the summer of 1914 Mt. Lassen commenced a series of eruptions which lasted through a period of more than five years. Large quantites of volcanic ashes and scoria were thrown out and half molten lava was pushed up in the crater.

The eruption formed a most interesting sight. Clouds of ashes rose many thousands of feet in the air presenting an appearance similar to that of Vesuvius, the great Italian volcano, when it is in eruption.



Mt. Lassen in eruption. The smoke cloud shows the features of a face.

Cinder Cone in eruption less than 100 years ago.

If we should climb Mt. Lassen and look away toward the east across the forested mountains we would see at a distance of about 20 miles a field of black rock with a cone-shaped mountain rising from it. This mountain is Cinder Cone and the black rock around it is lava.

It is believed that the eruption of volcanic ashes and the building of the cone-shaped hill occurred about 200 years ago, and that the flow of black lava, which covers about ten square miles, took place about 75 years ago. Thus the last eruption here was only a few years before the first white people crossed the mountains into California.

The story of Cinder Cone is very interesting. There were first violent explosions. Great quantities of volcanic ashes were blown into the air and carried by the wind over the surrounding country. Near the crater the ashes fell four to six feet deep killing all the surrounding trees. Many partly burned trunks still lie scattered about on the surface of the ashes.

Many large masses of lava called **volcanic bombs** were blown out and lie scattered thickly about the base of the cone. Some of these bombs are almost round and weigh more than a ton.

The slope of the cone is so steep and the cinders lie so loosely that it is difficult to climb it. From the summit one can look into a wonderfully symmetrical crater about 100 feet deep.

The stream of molten lava which came last blocked up the valley and formed a body of water called Snag Lake.

The Devil's Kitchen; steaming mud springs near the recent volcanic eruptions of cinder cone, east of Lassen Peak.

The surface of this lava flow is still rough and jagged for the rocks have not yet crumbled to form a soil for plants.

For what are the Modoc lava beds noted?

On the shore of Tule Lake near the Oregon line is another field of new lava. To this lava field Capt. Jack, a Modoc Indian, once retreated with his followers because it offered such secure hiding places. There he was able for a long time to resist United States soldiers.

The lava has a rough and jagged surface across which horses cannot be taken. It is difficult even for men to climb over the billows and hollows of the lava, for it is full of crevices, caverns and tunnels. In some of the deepest hollows the snow remains all summer.

Why was it easier to cross the plateau in the early days than to go through the Klamath Mountains?

The Volcanic Plateau is easy to travel over because of its broad, plain-like valleys. These valleys were once filled with lakes. They have an elevation of 3000 to 4500 feet and although they are separated by mountains there are no deep cañons to be crossed.

The worst difficulties are caused by the fields of bare lava which the traveler has to go around if possible. The building of the plateau took a long time and it is only the newest streams of lava that are still rough and impassable.

The lava as it slowly crumbles upon the surface becomes covered first with hardy bushes. Then, after a time, the seeds of pines sprout and take root and a forest springs up. The trees were at first small and stunted because of the thin soil, but as the years passed it became deep and rich. As we wander through the forest now with no rocks sticking out above the surface we can hardly believe that it was once so rough.

Mt. Shasta: The queen of the great volcanoes.

Mt. Shasta is the most noted and majestic of all the mountain peaks of California. It stands alone, rising far above the surrounding mountains, and is capped with a white helmet of snow throughout the year.

From the summit of Shasta, 14,380 feet above the ocean, we obtain a view over all of Northern California. To the southeast there appears a line of forest covered mountains extending to Mt. Lassen. These were once active volcanoes. In the opposite direction we can see, if the air is clear, the lofty peaks of the Cascade Range. These also were once active volcanoes. Looking toward the east we can make out scores of little volcanic mountains, or cinder cones as we usually call them.

Mt. Shasta began in the same way as did the cinder cones that lie scattered over the plateau, but its story did not stop as did theirs. For many thousands of years eruption followed eruption. Sometimes it was ashes and slag-like lava from the main crater; sometimes it was a lava stream which broke out of the side far below the summit.

Finally the mountain became so high that the craters broke out upon the sides. In this way Shastina, the lower peak, was made. Mt. Shasta is now probably extinct although there is a hot spring upon its summit.

Nature is at work tearing down the mountain. The rains and the water of the melting snows have washed great gullies in the loose materials. The glaciers, of which there are several, are also helping along the work of tearing down the mountain.

The strange lakes of the Volcanic Plateau.

As the lava flowed over the country during the building of the plateau it sometimes formed a dam across a valley, making a lake in the part lying above the dam. Fall River Valley and Big Valley were in this way once made to hold lakes. Tule Lake upon the Oregon boundary was also formed in a hollow in the lava.

Near Hot Spring Valley, a few miles east of Mt. Lassen, is a most peculiar lake. The water plants which abound in this region have grown nearly over the lake and have formed a floating meadow. This meadow is solid enough to support people who go out upon it and fish through holes which they have cut in the sod.

Goose Lake, one of the largest lakes in California, once formed the source of Pitt River. The climate of this region, like that of the Great Basin, is now drier than it used to be and the lake does not overflow its basin.

Mt. Shasta and Shastina from Shasta Valley—glaciers lie in the hollows between the peaks.

The peculiar rivers of the Volcanic Plateau?

Pitt River is one of the largest streams of California. It flows sluggishly through the valleys of the Plateau, but has cut a deep cañon upon its western edge where it rushes down to join the Sacramento.

One of the things which strikes the traveler upon the Plateau as very strange is the scarcity of springs and streams. Although the rainfall is heavy upon the higher parts, yet the lava is so full of pores and cracks that the water quickly disappears underground instead of gathering in streams on the surface. Upon some parts of the plateau there is as little surface water as is found in the desert.

The water creeps down through the lava until it comes to caverns or layers of gravel between different flows of lava. It flows along these, gathering from various sides until it forms an underground river. By and by this river reaches the edge of the lava flow and then appears upon the surface as a great spring of pure cold water.

Fall River is the largest and most remarkable river of this kind in California. It boils up through the rocks in several great springs, one of which supplies water enough to run a sawmill. This river winds through the meadows of Fall River Valley in a stream 100 feet wide and finally empties into Pitt River.

Hat Creek is formed by another of these underground streams. It bursts out of the rocks in great springs whose volume of water does not change through the year.

How does the climate of the plateau region compare with that of other parts of California?

Since the valleys of the Plateau are so high and are shut away from the ocean by mountains they are cold in winter and warm in summer. The sub-tropical fruits of the lower valleys cannot of course be grown here. In their place we find apples, peaches, pears, plums and cherries of a cooler climate.

Thus we discover again the interesting fact that we do not have to travel hundreds of miles toward the north to find a cooler climate. We have merely to ascend the mountains a few miles to the upland valleys where the climate, productions, and the occupations of the people are entirely different from those of the lower valleys.

The western part of the Plateau, including the slopes of the great volcanic peaks, receives a heavy rain and snowfall. It is, therefore, covered with a dense and valuable forest of sugar pine, yellow pine, spruce, fir and cedar.

The farther east we go toward the Great Basin the drier the climate becomes. The valleys are treeless while the mountains support a thin growth of pine and juniper.

What are the occupations of the people of the plateau?

Lumbering is the chief occupation of the heavily forested western portion. The mills are situated in the forests and the lumber is floated down to the railroads in flumes. Matches form one of the important manufactured products of these forests.

The raising of cattle, sheep and horses forms the leading occupations of the Plateau valleys. Hay and grain are also raised in large quantities. Fruits such as apples do well except in the highest valleys.

The lack of cheap transportation seriously hinders the development of farming. This makes it more profitable to raise cattle for they can easily be driven to market.

Why is it that there are no important mines in this region?

Except for the gold at Hayden Hill the lava rocks of the Plateau region contain no valuable minerals. The gold-bearing rocks of the Sierra Nevadas probably extend under the lava at a great depth, but we shall never be able to reach them.

Why is the plateau so thinly settled?

The Plateau region, although containing many fertile and productive valleys is thinly settled because it is remote from market and has always been difficult to reach. All supplies brought in or produce shipped out has to be freighted upon wagons over long and rough mountain roads.

The eastern part of the Plateau is now reached by a railroad which is being built from Reno in Nevada north into Oregon.

What is needed to develop the Volcanic Plateau?

Many of the valleys of the Plateau are beautiful and attractive and possess an agreeable climate. It can, however, never be thickly settled until there is easier communication with the markets of the Sacramento Valley.

As long as stock raising continues to be the most profitable industry the ranches must remain large and the population scattered.

SUMMARY.

Northeastern California is occupied by a volcanic plateau which is only a part of a greater plateau which extends over much of Oregon, Washington and Idaho.

The western part is densely forested. The broad plain-like valleys toward the east are drier and have a cold winter climate.

The two most striking features of the Plateau are Mts. Shasta and Lassen. The former presents the grandest scenery of any single mountain in California. The latter is noted for its recent eruptions.

The region about Cinder Cone is remarkable for its fresh lava field, mantle of volcanic ashes, and hot and boiling springs.

The Volcanic Plateau, because it is far from market, is thinly settled, and devoted chiefly to the raising of such products as cattle that can be disposed of more profitably than other things.

REVIEW EXERCISES.

How do men harness steam and make it work?

What has steam to do with the making of cinder cones and volcanoes?

Describe the appearance of a piece of slag or lava.

What uses are made of pumice and volcanic ashes? What makes sand soap clean so well?

What do we mean by an **active volcano?** An **extinct volcano?**

Describe the surface of a field of freshly cooled lava.

Why is it difficult to travel over fresh lava with horses and wagons?

How does Nature finally smooth off the surface?

Describe the country around Cinder Cone. (Study if possible the Mt. Lassen Folio, U. S. Geological Survey, Wash.)

How do you account for the few streams and springs on the Volcanic Plateau? What becomes of the rainwater?

How do Fall River and Hat Creek differ from ordinary streams?

Why is the Plateau thinly settled? From what directions can it be most easily reached by railroad?

What are the disadvantages of farming on the Plateau? What are the advantages of stock raising?

Why are the winters cold? What part of the Plateau contains the forests and why?

What leads us to believe that there may be more volcanic eruptions in the Plateau region?

PRACTICAL LESSONS.

Volcanic regions are usually regions of earthquakes, but earthquakes may occur where there are no volcanoes. The great earthquake rift of the Coast Ranges has no volcanoes near it.

Volcanic eruptions have probably not ceased in regions where there are hot and boiling springs.

Volcanic mountains are usually more picturesque, for example, Mt. Shasta, than other mountains for they stand out by themselves. Mt. Whitney is higher than Mt. Shasta but is far from being as picturesque.

Volcanic regions have usually few surface streams; the water flowing underground. Many great springs abound in volcanic regions where underground rivers come to the surface.

Regions covered with volcanic soil are very productive if there is sufficient rainfall.

Regions left by Nature difficult of access settle up slowly until railroads are built to them.

The occupations of a region are determined by many things, chief among which are climate and accessibility.

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